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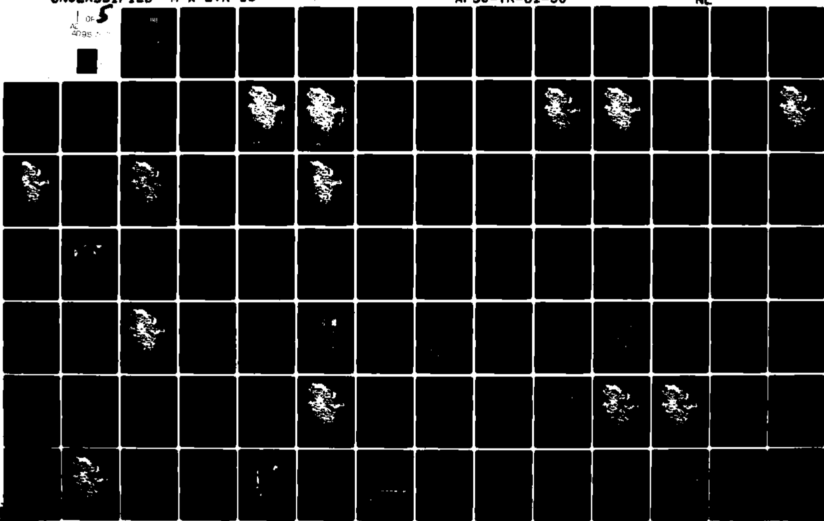

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For this report wildlife is broadly categorized into game and nongame animals. the most abundant and economically important game animals are the hooved mannals and upland game birds, and these are treated throughout their ranges in Nevada and western Utah. The remaining game (primarily furbearers) and nongame coverage is that recreationally important game species may be impacted by the project, either directly or indirectlyk wherever they occur in or near the study area, while furbearers and nongame species are most likely to be affected only in the valleys used for deployment.

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ENVIRONMENTAL CHARACTERISTICS OF ALTERNATIVE DESIGNATED DEPLOYMENT AREAS: WILDLIFE

Prepared for

United States Air Force
Ballistic Missile Office
Norton Air Force Base
California

By

Henningson, Durham & Richardson
Santa Barbara, California

22 December 1980

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1.0 INTRODUCTION

Wildlife is treated in two parts: threatened and endangered species, and other wildlife species. Threatened and endangered species are discussed in the Technical Report on Protected Species (ETR-17). This report focuses on "other" wildlife species.

"Other" wildlife species, as well as protected species, constitute an indicator of ecosystem stability or instability. Alteration of major components of an ecosystem would cause some instability and long-term effects such as decreased productivity. Potential impacts associated with increased human population could include reduction in game animals and increases in pest species impacting agriculture and livestock. Vegetation communities may also be significantly changed through fluctuations in herbivore populations. There is an aesthetic component to observing wildlife for recreation. Wildlife is also an issue because of its economic value. Hunting and fishing are at the core of a 21 billion dollar a year wildlife oriented industry (USFWS 1980). Hunting and trapping bring money to the states, are the sole financial support for state departments of wildlife, and provide funds for wildlife research and restoration. Trapping constitutes an important source of income for many private individuals. Wildlife populations can affect livestock and agriculture resulting in a loss of income to ranchers and farmers. Examples include coyote predation on sheep, and deer depredation in orchards. Also, wildlife populations that have become out of balance with their resources in national parks and other protected ecosystems have caused destruction of portions of these systems, compromising their aesthetic and ecological values.

The Nevada/Utah study area, with its alternating basins and high mountain ranges, contains an array of wildlife habitat types including forests, woodlands, and shrublands. Characteristic big game species include elk, bighorn sheep, mule deer, and pronghorn. Wild horses, introduced to the area by European man, are numerous in many of the valleys and compete for forage with domestic livestock and native species. Wetland habitats in some of the valleys are important stopover areas or breeding habitats for large numbers of migratory waterfowl and shorebirds. Over much of the area, wildlife habitat is continuous and essentially intact, although the vegetation has changed in historical times in response to years of domestic livestock grazing. Most of the land is public and is managed for multiple uses, including wildlife habitat values, by the Bureau of Land Managmeent and U.S. Forest Service. Wildlife management (as opposed to habitat management) is the responsibility of the Nevada Department of Wildlife and the Utah Division of Wildlife Resources.

The Texas/New Mexico study area was historically a comparatively homogeneous wildlife habitat type of shortgrass prairie spotted with playa lakes and sandhill areas and occasionally broken by the roughland of the few major river drainages in the area. Much of the Texas suitable area is now cropland which supports such game species as pheasant and bobwhite quail. Rangeland, which is intensively used for grazing, supports pronghorn antelope. Both mule deer and white-tailed deer also occur in the area. The playa lakes are important habitat for migratory waterfowl along the central flyway and several of the largest playa lakes are managed for their waterfowl values as National Wildlife Refuges. Most of the Texas/New Mexico study area is fenced private land, some of which is managed by the landowners for wildlife with the cooperation of the state departments of wildlife.

For this report wildlife is broadly categorized into game and nongame animals. The most abundant and economically important game animals are the hooved mammals and upland game birds, and these are treated throughout their ranges in Nevada and western Utah. The remaining game (primarily furbearers) and nongame animals, however, are considered only in the valleys. The rationale for this coverage is that recreationally important game species may be impacted by the project, either directly or indirectly, wherever they occur in or near the study area, while furbearers and nongame species are most likely to be affected only in the valleys used for deployment.

1.1 WILDLIFE - NEVADA/UTAH

COMMON AND TYPICAL NON-GAME WILDLIFE

The Nevada/Utah M-X study area contains a few species of animals found principally in the Great Basin; most species, though, have geographic distributions that include much of the western United States. The study area lies in a zone of north-south and east-west biotic transition with the north-south transition especially well-marked in the southern portions of the study area. The distribution of individual species tends to be more or less restricted to certain broadly definable habitat types. Some species are habitat-specific, others tend to be more or less ubiquitous.

For common and typical nongame wildlife, the major classes of terrestrial animals (mammals, birds, and reptiles) are common in the Great Basin Desert. Depending on the habitat, some of the more ubiquitous species include the side-blotched lizard (Uta stansburiana), whiptail lizard (Cnemidophorus tigris), gopher snake (Pituophis melanoleucus), Great Basin rattlesnake (Crotalus viridis lutosus), white-tailed antelope ground squirrel (Ammospermophilus leucurus), desert cottontail rabbit (Sylvilagus auduboni), black-tailed jackrabbit (Lepus californicus), coyote (Canis latrans), horned lark (Eremophila alpestris), raven (Corvus corax), and red-tailed hawk (Buteo jamaicensis).

The sage thrasher (Orcoscoptes montanus) nests exclusively in tall sagebrush, and the sagebrush vole (Lagurus curtatus) is restricted to big sage throughout the Great Basin. The sagebrush lizard (Sceloporus graciosus) is not restricted to big sage, but is most common at the middle elevations where sage habitat is common. The Great Basin pocket mouse (Perognathus flavus) is typical of sagebrush habitat as are least chipmunks (Eutamias minimus). A variety of raptors, including the marsh hawk (Circus cyaneus) and golden eagle (Aquila chrysaetos), forage in the big sage habitat type, which is often considered the characteristic plant of the Great Basin.

The Great Basin kangaroo rat (Dipodomys microps) is closely associated with shadscale habitat, which is found in the lower, but well-drained portions of valleys, and has special behavioral and morphological adaptations for eating the leaves of saltbush (Renagy, 1972). Several lizard and snake species are common in the shadscale/black sage/greasewood habitat. Among these are the zebra-tailed lizard (Callisaurus draconoides), the side-blotched lizard, and the desert horned lizard (Phrynosoma platyrhinos). The collared lizard (Crotaphytus collaris) commonly occurs in rock outcrops within this habitat. The Great Basin rattlesnake is seen in many habitats throughout the Great Basin and the gopher snake is common in the shadscale and big sage habitats. Black-throated sparrows (Amphispiza bilineata) are

summer residents, and horned larks and loggerhead shrikes (Lanius ludovicianus) are permanent residents in both shadscale and big sage habitats. Horned larks are especially noticeable during winter, when they form large flocks. Many animals typical of the more southern deserts such as the long-nose snake (Rhinocheilus lecontei) and desert spiny lizard (Sceloporus magister) are also found in the shadscale community. Appendix Table 1.6.1-1 lists common and typical amphibians, reptiles and mammals by habitat.

Scrub jays (Aphelocoma coerulescens), mountain bluebirds (Sialia currucoides), and dark-eyed juncos (Junco hyemalis) are found in pinyon-juniper woodland at lower elevations. Many other species found here are the same as those in the big sage community.

An especially diverse avifauna which includes warblers, flycatchers, magpies (especially near farmlands), and various raptors, is associated with riparian habitats which occur around springs and along streams and arroyos in many valleys (Table 1.6.1-2). Appendix 2 lists common and typical species of birds by habitat and gives their season of occurrence. A variety of warblers is found in tree plantations which are associated with towns, ranches, and springs in the Great Basin. These planted trees form a distinct habitat type with a diverse bird life including the robin (Turdus migratorius), house sparrow (Passer domesticus), great-horned owl (Bubo virginianus), and Cooper's hawk.

Cottontail rabbits are relatively common in brushy floodplain habitats, as well as along arroyos and irrigation ditches. The Great Basin spadefoot toad (Scaphiopus intermontanus) often breeds in permanent or seasonal ponds in low valley areas during spring runoff and forages there during a short period of time. This species spends the remainder of the year buried in the soil on the playa fringes.

The leopard frog (Rana pipiens) and the bullfrog (Rana catesbiana), two of the few aquatic amphibians found in the Great Basin, can be found in springs and water catchments throughout the area. Amphibians, in general, are not found in large numbers in the Great Basin.

In the southern and southwestern portions of the study area the desert kangaroo rat (Dipodomys deserti) is restricted to areas of deep sand and sand dunes. The western ground snake (Sonora semiannulata) may be similarly restricted. Irrigated fields represent the major habitat for the magpie (Pica pica) in the Nevada/Utah study area, although other species, such as prairie falcon (Falco mexicanus), Cooper's hawk (Accipiter cooperi), and red-tailed hawk seem to be attracted to agricultural areas.

A variety of other common species of animals found in the Nevada study area are categorized in Appendix 1.

Game Animals

Game animals are subdivided into big game, upland game, furbearers, and waterfowl.

Big Game

Big game animals in Nevada and western Utah include pronghorn antelope (Antilocapra americana), mule deer (Odocoileus hemionus), bighorn sheep

(Ovis canadensis), American elk (Cervus canadensis), and mountain lion (Felis concolor).

Bison (Bison bison) have been introduced into the Henry Mountains of southeastern Utah, and moose (Alces alces) populations in north central Utah are expanding (Jense and Burruss, 1979). No impacts to these species are expected to result from M-X deployment, and they will not be considered further in this report.

Pronghorn were once widely distributed and extremely abundant in the prairies of central and western North America. Populations were drastically reduced in the 1800s from about 40 million to about 10,000, primarily as a result of overhunting and competition with livestock grazing and agriculture (Yoakum, 1978). In the Great Basin, pronghorn inhabit valleys but also can be found in areas of open pinyon-juniper woodland. They are not generally considered migratory but do move to locate adequate forage and water. The present distribution of pronghorn in Nevada and western Utah is shown in Figure 1.1-1. Not all of their historic range in these areas is presently occupied, and densities are generally lower than in historic times. Strict regulation of hunting and transplants to former ranges are allowing herds to recover somewhat.

Pronghorn are most abundant in the northwest portion of the state, in Washoe and Humboldt counties. Reasonable numbers (i.e., long-term management goals considering multiple use of range lands) have been developed by the Nevada Department of Wildlife for most areas inhabited by pronghorn. Actual abundances, however, are often considerably lower. Reasonable numbers indicate that highest abundances in the study area are (or will be in the future) in eastern Nevada. Valleys included in this area are northern Steptoe, Antelope, Spring, Snake, Hamlin, and Lake. Reasonable numbers range from 235 to 915 for each of these valleys. Numbers in other valleys are generally lower. No data are currently available for western Utah.

Pronghorn require open expanses that offer fairly unobstructed visibility from horizon to horizon. The optimum elevation is 4,000 ft to 6,000 ft, and optimum precipitation levels are 10 in. to 15 in. Available water must be within 1 mi to 5 mi. Equal amounts of living and dead vegetation that is about 15 in. tall provides the best habitat. Plant species diversity is also important, especially the presence of succulent forbs. A mix of about 40 percent to 60 percent grasses, 10 percent to 30 percent forbs, and 5 percent to 20 percent browse is required (Yoakum, 1978). Areas where most or all of these criteria are present during critical times of the year (e.g., when kids are born and during dry summer months) have been designated as key habitat areas by the Nevada Department of Wildlife (Figure 1.1-1). Similar designations for western Utah have not been completed at this time.

Mule deer are widely distributed in North America. Habitat loss and overhunting reduced populations in many areas during the 1800s (Wallamo, 1978). In the Great Basin, however, deer were historically quite sparse. With the decline in cattle and sheep grazing, depleted ranges revegetated with more shrubs which are necessary to support deer (Papez, 1976), and the deer population expanded. The present distribution of mule deer in Nevada is shown in Figure 1.1-2. Only winter range information is currently available for Utah. As can be seen in this figure, deer are primarily montane species. Total range is further divided into seasonal use areas (e.g., summer, winter, spring, and yearlong). Summer ranges are at higher

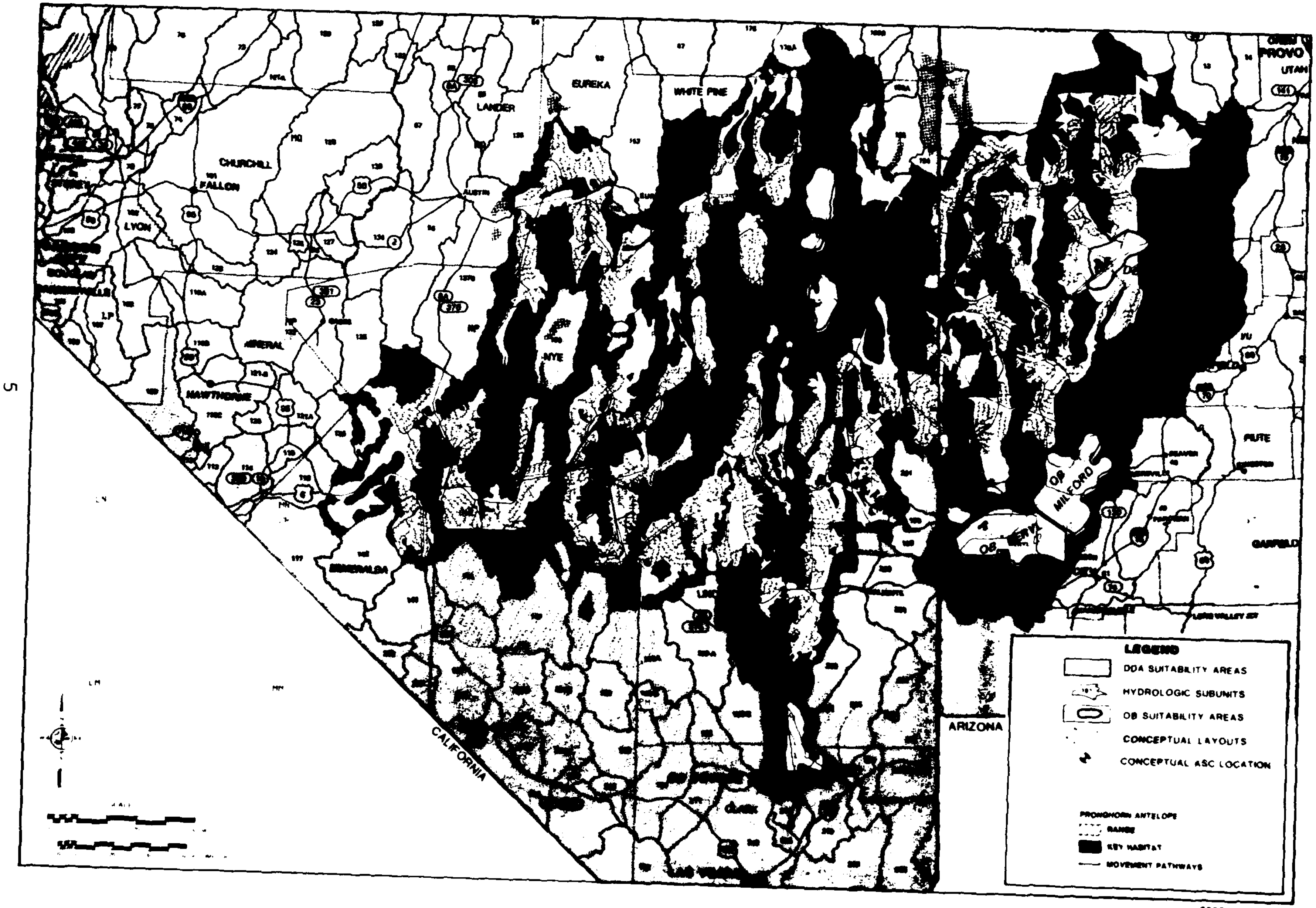

Figure 1.1-1. Present distribution of pronghorn in Nevada and western Utah.

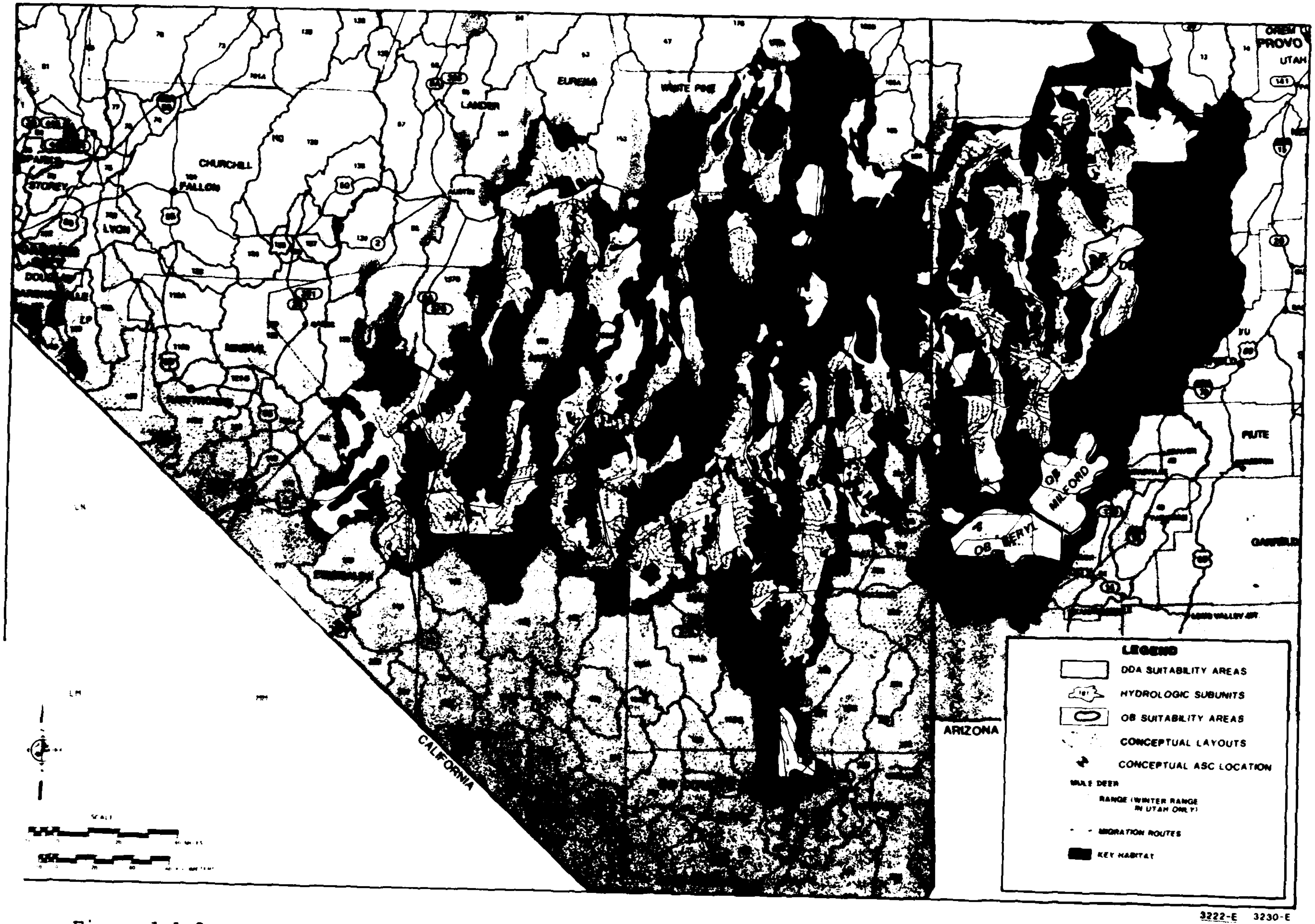

Figure 1.1-2. Key habitat and migration routes of the mule deer in the Nevada/Utah study area.

elevations where water and forage are available during the hot, dry months. In winter, deep snows force deer to lower elevations where they often concentrate in areas that provide forage and cover. These areas are critical for deer survival (Wallamo, 1978). Deer migrate between these seasonal ranges along fairly well established routes. Migration to other areas is also common. Key habitat in all ranges and some of the migration routes have been identified by the Nevada Department of Wildlife and are shown on Figure 1.1-2. Key habitat information is not presently available for Utah, and only a portion of the migratory routes are known in western Utah.

Population estimates indicate that approximately 35 percent of the deer in Nevada inhabit the mountain ranges of Elko County (Tsukamoto, 1979a). Within the study area, high numbers (17,700) occur in the Ruby Mountains (Nevada Dept. Wildlife, 1980) and moderate numbers inhabit most of the ranges southwestward to (and including) the Toiyabe, Toquima, and Monitor Ranges. Moderate abundances are estimated for the Schell Creek, Snake, and Wilson Creek Ranges as well. Other ranges in the study generally support relatively low numbers of deer. In the west desert area of Utah, deer abundances are very low.

Bighorn sheep (*Ovis canadensis*) is another species whose range and abundance have been greatly affected by human settlement. In Nevada, most of the mountain ranges historically supported bighorns. California bighorns (*O. c. californiana*) once inhabited ranges from the Pine Nut Mountains near Carson City through Washoe County to the Santa Rosa Range in Humboldt County. Rocky Mountain bighorns (*O. c. canadensis*) were found primarily in Elko and White Pine counties as far south as the Egan and Schell Creek ranges. Desert bighorns (*O. c. nelsoni*) inhabited many of the ranges in southern and central Nevada. Competition with domestic livestock and transmission of disease from domestic sheep appear to be the most important factors in causing the extirpation of bighorns from northern, central, and parts of southern Nevada, although overhunting also contributed (McQuivey, 1978).

Bighorns currently occupy 24 ranges in Nevada and have been transplanted to four more ranges. Population estimates for 1976 (Table 1.1-1) indicate a total population of 4,261 sheep in Nevada, with highest abundances found in the Sheep Range and Mormon Mountains. Approximately 60 percent of the state-wide population inhabits the Pinewater, Desert, East Desert, Sheep, and Las Vegas Ranges in the southern part of the study area. Densities in all inhabited ranges varied from 0.5 to 6.0 animals/mi^2 with a mean density of 1.9 sheep/mi^2. Competition with cattle grazing currently limits bighorn population sizes in central and southern Nevada (McQuivey, 1978). No population data are currently available for Utah.

In the arid Great Basin, water limits the distribution and population size of bighorns, especially during summer when they are limited to areas within 2 mi of available water. The requirement for nearby free water decreases during the other seasons and may be nonexistent in winter. During winter, populations disperse to areas that do not contain permanent water sources. During summer they are concentrated around permanent water sources, occupying only 15 percent to 20 percent of the available habitat (McQuivey, 1978). Migrations to lower elevations in winter and to higher elevations in summer also occur. The distance traveled, however, is generally less than 40 mi. Migrating sheep usually follow contour lines or take the shortest distance between rocky points (McQuivey, 1978). Other habitat

Table 1.1-1. Bighorn sheep population estimates for the mountain ranges in or adjacent to the study area.

RANGE	1976 ESTIMATE[1]
Lone Mountain	146
Monte Cristo Range	70
Toiyabe Range	50
Grant Range	100
Meadow Valley Range	155
Mormon Mountains	385
Delamar Range	50
Arrow Canyon Range	104
Stonewall Mountain[2]	8
Pintwater Range	252
Desert Range	156
East Desert Range	139
Sheep Range	732
Las Vegas Range	277
Snake Range	16
STUDY AREA TOTAL[3]	2,616
STATE TOTAL[3]	4,261

761

[1]Data from McQuivey (1978) for all but Snake Range, in which 16 Rocky Mountain sheep were introduced in 1975 (Wickersham et al; 1976).

[2]Transplant population.

[3]Does not include transplant populations since there are not established herds.

Source: McQuivey, 1978; Wickersham, et al., 1976.

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adequate forage. Present distributions of bighorns are shown in Figure 1.1-3; none occur in the study area.

Desert bighorn sheep are native to southeastern Utah and populations suffered from hunting in the 1940s and 1950s when uranium mining began on the Colorado Plateau (Jense and Burruss, 1979). Sheep are sensitive to rapid habitat modification as evidenced by responses to new roads. For instance, bighorn inhabited the Virgin River Gorge in southern Utah and northwestern Arizona prior to the construction of Interstate #15, but they no longer occur there. Similarly, sheep in the Providence Mountains of the Mohave Desert originally traversed areas currently bisected by Interstate #40. Although tunnels have been constructed to allow migration they have not been used (Weaver, pers. comm.). Bighorn sheep were also historical occupants of some of the mountain ranges in southwestern Utah and Rocky Mountain sheep were found in the Wasatch and Uinta Mountains (John, 1975). Hunting restrictions and reductions in grazing have allowed populations to recover somewhat.

Rocky Mountain elk were once abundant in North America but have been decimated through hunting and habitat loss (Boyd, 1978). In Utah, elk were abundant in the mountains of the north and central part of the state prior to settlement by white men. By 1913, however, they had been extirpated from all but the Uinta Mountains. Interstate transplanting from 1913 to 1925 and regulated hunting have allowed elk to recover substantially (Jense and Burruss, 1979). Elk are not native to Nevada but were transplanted to the Schell Creek Range by sportsmen in 1932 (Walstrom, 1973) and to the Spring Mountains near Las Vegas. Transplants to the Monitor Range were also made in 1979 by the Nevada Department of Wildlife. The present distribution of elk in Utah and Nevada is shown in Figure 1.1-4.

The mountain lion probably had the greatest north-south distribution of any mammal in the western hemisphere before the arrival of Europeans. In the United States, this species ranged from coast to coast and from the Canadian border southward. In the U.S., because of loss of habitat, reduction of deer populations, and intense predator control efforts, mountain lions were restricted primarily to mountainous areas of the West by the 1920s (Russell, 1978). In the western United States mountain lion habitat is primarily rugged rocky terrain with dense cover such as forest or brushland. In Nevada and western Utah, mountain lions are found in relatively undisturbed areas of most mountain ranges with prime habitat above 7,000 ft in elevation. Signs of this species are rarely encountered in valleys or areas of sparse vegetation. Lower elevations are utilized by mountain lions primarily when crossing from one mountain range to another. As with all carnivores, mountain lions are closely tied to their major prey species. In Nevada and western Utah the distribution of lions conforms closely to the distribution of mule deer.

Population estimates for mountain lions are difficult to make because of their wide ranging and secretive behavior. The state of Nevada estimates that there are roughly 260 lions currently within the Nevada portion of the study area. This population estimate was derived by a combination of aerial surveys, detection of sign on the ground, harvest by hunters, predator control results, and observations by field personnel. Virtually all of the occupied mountain lion habitat in Nevada is believed to be supporting a maximum density of animals (Tsukamoto, 1980). No population estimates for western Utah are currently available.

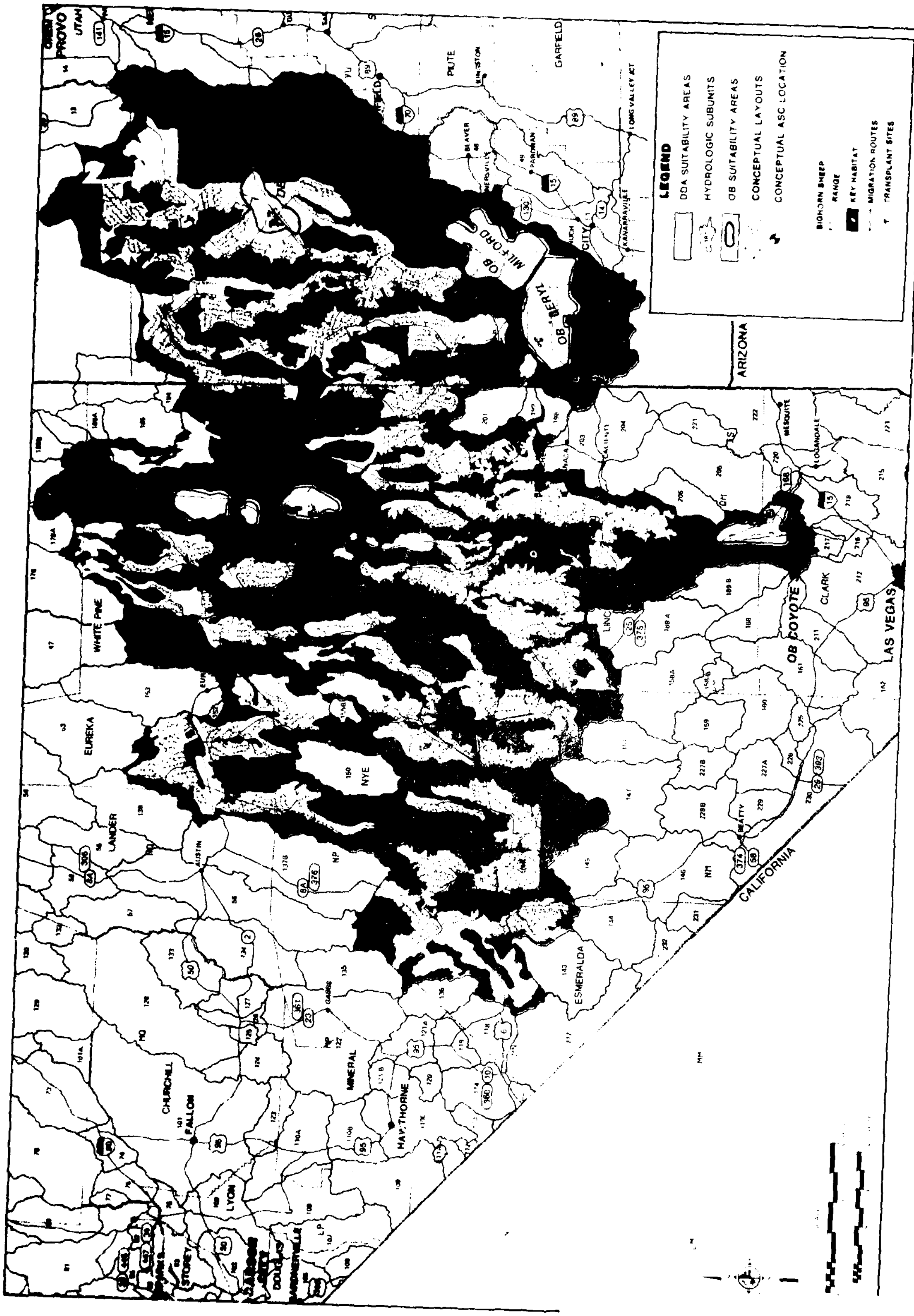

Figure 1.1-3. Distribution of bighorn sheep in the Nevada/Utah study area

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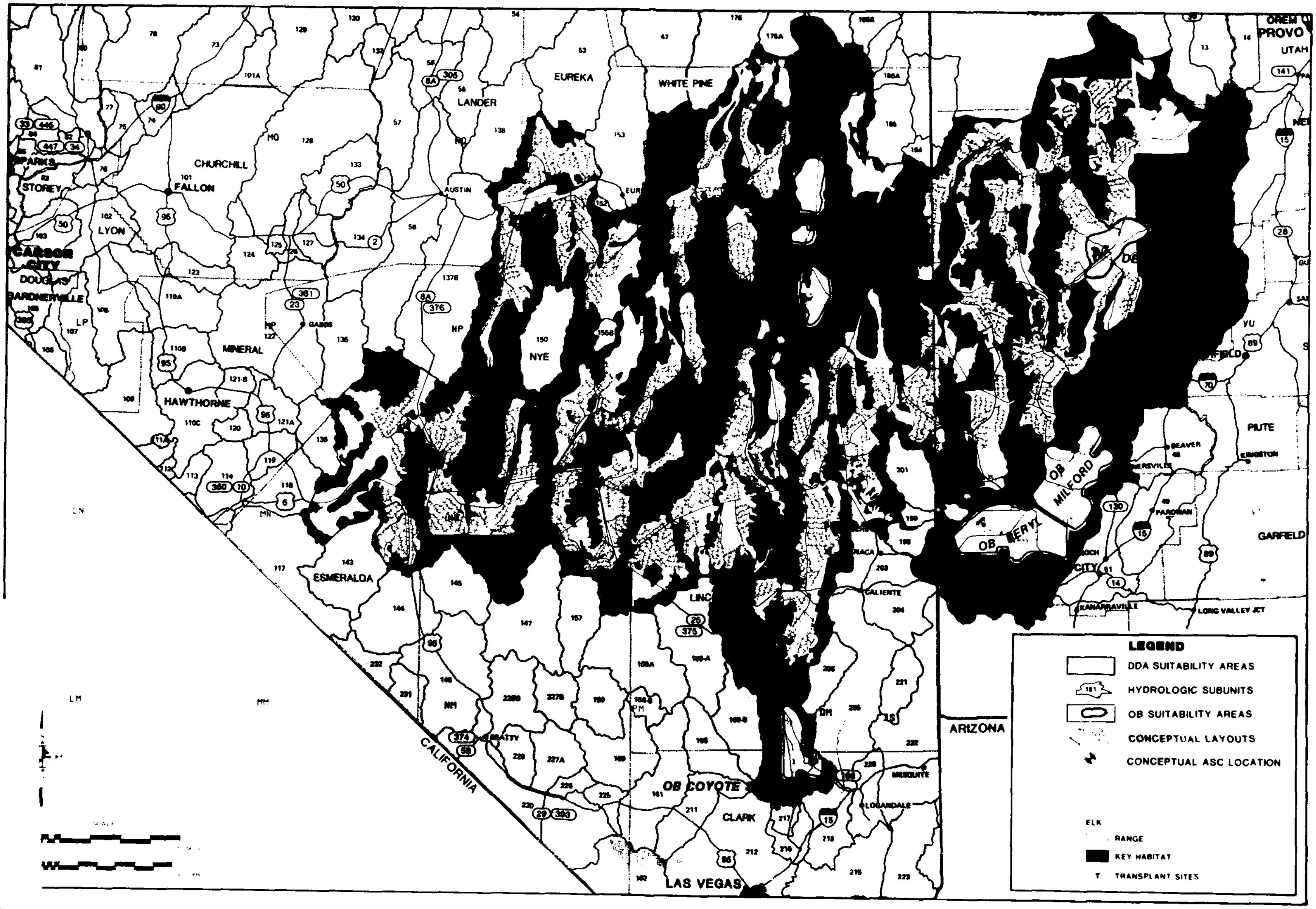

Figure 1.1-4. Distribution of elk in the Nevada/Utah study area

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Upland Game

A number of native and introduced species of upland game birds inhabit the Nevada/Utah study area (Table 1.1-2). Doves are probably the most abundant species present, occurring in most habitat types from spring to September, after which they migrate south. The greatest densities are found in agricultural and riparian areas. Recent data (Molini and Barngrover, 1979; Leatham and Bunnell, 1979) indicate that harvest in the study area is greatest in Clark, Elko and White Pine counties of Nevada, and Juab and Millard counties of Utah.

Sage grouse, another native species, inhabits upland meadows and valleys in much of the study area. As their name indicates, sagebrush is their preferred habitat, and sagebrush (along with forbs) is the primary food of adults. In Spring, males perform courting rituals on established strutting grounds, which are open grassy areas. Nesting occurs on the ground with the vast majority of nests located under sagebrush (Gill, 1975), and with sagebrush canopy coverage in the 20-40 percent range (Patterson, 1952). Brood-use areas are usually located within a 2 mi radius of strutting grounds (Gill, 1975). Broods are greatly dependent on highly nutritious succulent forbs to sustain them during their first months of life. As these forbs dry out during summer at the lower elevations sage grouse and their broods move upward in elevation. During this time mountain meadows become very important to sage grouse survival (Oakleaf, 1971). Sage grouse are known to be negatively affected by sagebrush removal and will abandon strutting grounds, brood-use areas, and wintering grounds if adjacent habitat is disturbed (Braun, et al., 1977). Known strutting grounds and brood-use areas in Nevada/Utah are shown on Figure 1.1-5. Recent population trends in Nevada/Utah indicate that sage grouse populations are either stable or increasing slightly (Molini and Barngrover, 1979). Data for the distribution of upland game animals are generally less reliable than those for big game species for several reasons. Upland species are smaller than big game animals and, therefore, more difficult to observe. In addition, management of these species is usually less intensive than for big game, resulting in less time and effort expended in field surveys.

Blue grouse is native to higher elevation mountain areas of Nevada and Utah, usually in fir forests. They are similar to sage grouse in size, and their range extends about as far south as does that of the sage grouse (Figure 1.1-6). Population levels appear to be increasing in recent years in both Utah and Nevada (Molini and Barngrover, 1979; Leatham and Bunnell, 1979).

Gambel's quail is a native game bird of southern Nevada and southwestern Utah (Figure 1.1-6). This species inhabits desert scrub areas in valleys and on slopes around mountain ranges. In Nevada, population levels are stable and abundant (Molini and Barngrover, 1979).

Mountain quail and scaled quail have been introduced into Nevada but not in Utah; California quail have been introduced in Nevada and Utah. In Nevada, these species occur primarily in the northern and central part of the state. California quail is the most abundant of these introduced species with highest population densities in canyons leading into mountain ranges and in some agricultural areas (Figure 1.1-6). California quail occur only marginally in the West Desert of Utah, with only Juab and Millard counties reporting harvests of this species (Leathan and Bunnell, 1979).

Table 1.1-2. Native and introduced upland game birds in Nevada and Utah.

COMMON NAME	SCIENTIFIC NAME	NATIVE	INTRODUCED
Sage grouse*	*Centrocercus urophasianus*	Nevada and Utah	
Ruffed grouse	*Bonasa umbellus*	Utah	
Blue grouse*	*Dendragapus obscurus*	Nevada and Utah	
Sharp-tailed grouse	*Pedioecetes phasianellus*	Utah	
Mourning dove*	*Zenaida macroura*	Nevada and Utah	
Band-tailed pigeon	*Columba fasciata*	Utah	
Wild turkey*	*Meleagris gallopavo*	Utah	
Chukar partridge*	*Alectoris chukar*		Nevada and Utah
Hungarian partridge	*Perdix perdix*		Nevada and Utah
Gambel's quail*	*Lophortyx gambelii*	Utah and Nevada	
California quail*	*Lophortyx californicus*		Nevada and Utah
Scaled quail*	*Callipepla squamata*		Nevada
Ringneck pheasant	*Phasianus colchicus*		Nevada and Utah
White-wing pheasant	*Phasianus* spp.		Utah

469

*Species found in the study area.

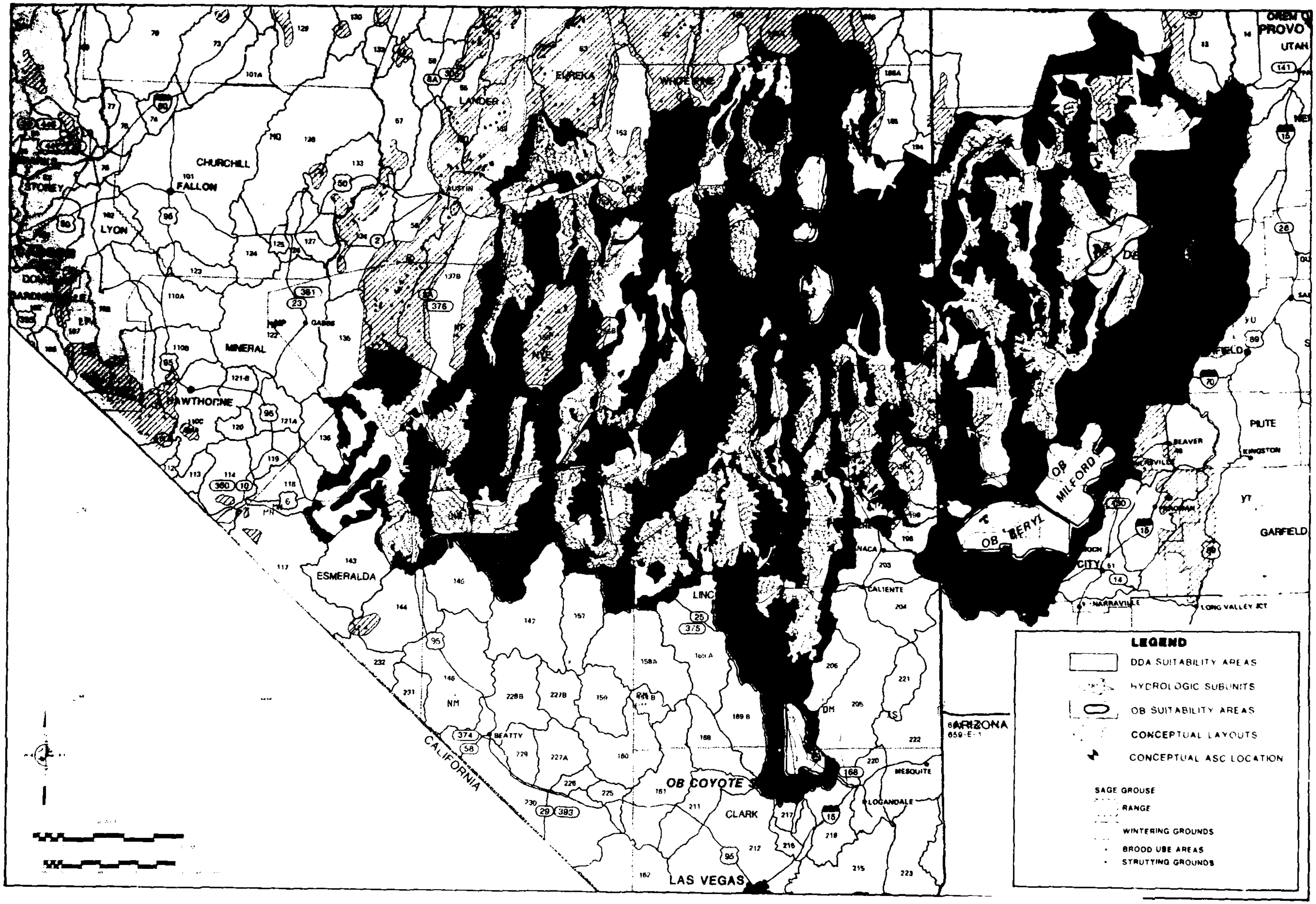

Figure 1.1-5. Distribution of sage grouse in the Nevada/Utah study area

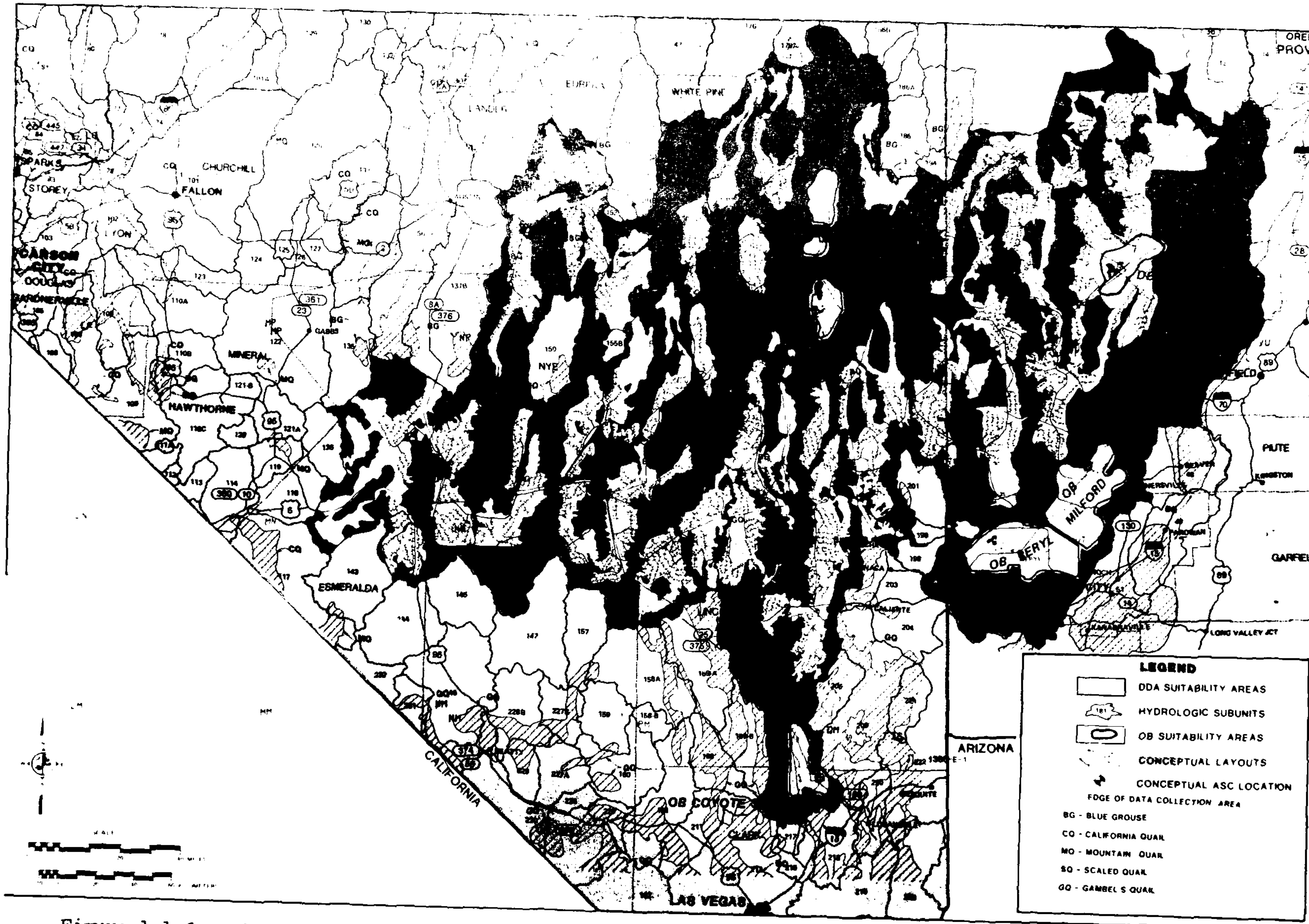

Figure 1.1-6. Distribution of blue grouse and quail in the Nevada/Utah study area.

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Chukar partridge, an introduced species, is an abundant and prized game bird. In Nevada, chukar inhabit shrub grasslands in most of the mountain ranges and move down into valleys when snow covers forage plants. Abundances are lowest in the eastern and southern portions of the state (Christensen, 1970). Their distribution in the mountains of western Utah is limited by water availability. In both states, population size fluctuates greatly from year to year. Their distribution is shown in Figure 1.1-7.

Ring-necked and white-winged pheasants occur in agricultural areas in parts of Utah and Nevada but are not widespread. Wild turkeys have limited distribution in forested areas of both states.

Most upland game species have short life spans, and their abundances fluctuate considerably from year to year in response to climatic factors which regulate reproductive success and mortality. In the future, population levels are expected to continue to show these fluctuations with long-term abundances remaining about the same. Sage grouse populations, however, may decline unless habitat loss can be stopped and upland meadows can be restored (Walstrom, 1973).

The location and number of sage grouse strutting grounds and brood-use areas shown on the map represent only those currently known. Others certainly exist, particularly in less studied areas such as south of Highway 50 in Nevada.

Furbearers

Because of recent higher prices paid for the pelts of certain animals (Table 1.1-3) furbearers have become increasingly important. Bobcat pelts have risen in value the most in recent years, making them more in demand by trappers. Because of federal laws regulating export of pelts, agencies recently have been involved in intensive management of this species. The bobcat in Nevada can be found in virtually every part of the state. Preferred habitats are those areas with rock outcrops mixed with shrubby vegetation such as sagebrush, wild rose, chokecherry, willow, and others. Riparian zones (i.e., near streams or marshes) may contain larger numbers of bobcats than the surrounding drier areas (Ashman, 1979). Jackrabbits and cottontails are their primary food source, but they occasionally kill mule deer and pronghorn young. Until recently, in Utah, trapping or hunting of bobcats was prohibited because little was known about their population size and distribution. Recent change in Utah Division of Wildlife Resources (Utah DWR) status designation now allows trapping of bobcats. In the West Desert they probably are of low densities and would be found in the same habitats as in Nevada.

Coyotes are not protected in either state, but their pelts have value (Table 1.1-3) and they are trapped. Coyotes can be found in almost every habitat type from valleys to mountains. They are opportunistic feeders and will eat rabbits, rodents, carrion, and fruits among other food items. In many areas of the southwest they occur in large numbers varying somewhat with prey availability.

Kit foxes are listed as furbearers by both states, and many were taken in Clark and Lincoln counties of Nevada in 1978 (Molini and Barngrover, 1979). Kit foxes are nocturnal and are a low-elevation species, being found only in valleys or adjacent foothills, wherever prey are sufficient (Ashman, 1979). Prey consist of jackrabbits, cottontails, and small rodents. In the M-X study area kit foxes are likely to be found in all valleys.

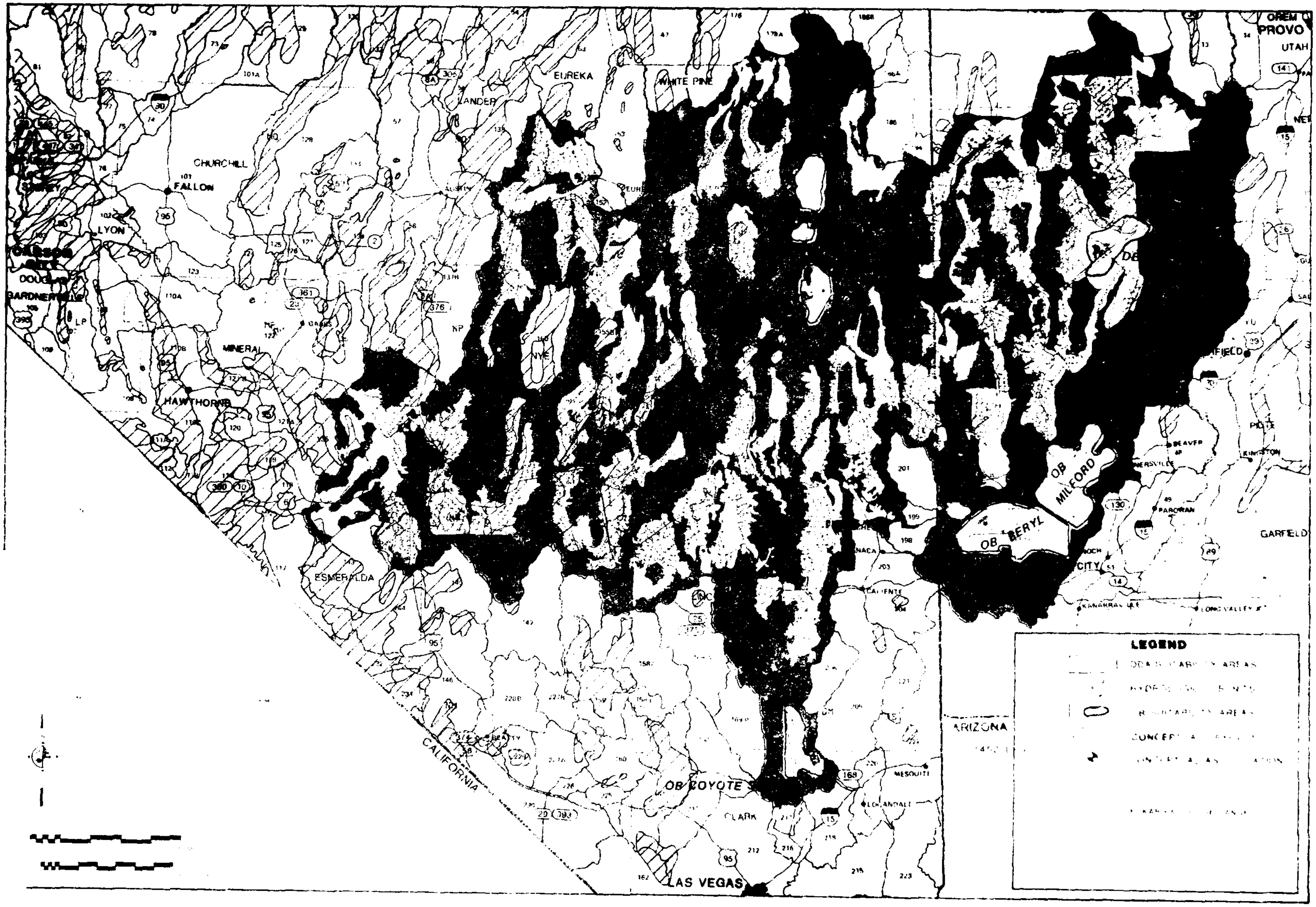

Figure 1.1-7. Distribution of chukar partridge in the Nevada/Utah study area.

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Table 1.1-3. Fur harvest value data for Nevada for 1978.

SPECIES	TOTAL VALUE OF PELTS TAKEN	AVERAGE PRICE PER PELT IN 1978	AVERAGE PRICE PER PELT IN 1977	PERCENT INCREASE (+) IN PELT VALUE FROM PREVIOUS YEAR
Beaver	$ 10,918.05	$ 15.27	$ 9.22	+ 66
Muskrat	38,701.18	3.91	3.88	+ 1
Coyote	466,035.80	55.10	34.63	+ 59
Bobcat	1,458,975.60	314.57	173.94	+ 81
Gray Fox	51,741.17	45.11	29.06	+ 55
Kit Fox	14,791.53	12.61	9.16	+ 38
Mink	1,285.70	11.18	8.16	+ 37
Raccoon	3,223.44	21.78	14.81	+ 47
Badger	15,402.39	22.29	15.53	+ 44
Striped Skunk	433.03	2.79	2.12	+ 32
Spotted Skunk	293.56	6.22	.50	+1,244
Weasel	56.00	4.00	.78	+ 510

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Source: Molini and Barngrover, 1979.

Gray foxes are found in the southern half of Nevada (Ashman, 1979) and much of Utah's West Desert (Hall and Kelson, 1959). This area covers most of the M-X study area. They occupy much the same habitat types as bobcats, being found in pinyon-juniper woodlands, northern desert shrub (Upper Sonoran), chaparral (Mahogany-mountain brush), and in the southern desert shrub type (Hall, 1946; Deacon et al., 1964).

Beaver and muskrat occur in some aquatic habitats of the study area; they are also trapped for their pelts. These species are limited in population size and distribution.

As for most upland game, abundance data for furbearers are not available. Current population levels are not expected to change unless water and habitat are lost or unless trapping pressures are increased. The example of the sensitivity of furbearer populations to increasing demand and resultant trapping pressure was given by Smith and Ordan for an over-exploited population of muskrat (1976) (Walstrom, 1973).

Waterfowl

Ducks, geese, and swans are among the migratory birds utilizing the Pacific Flyway of which Nevada is a part. These waterfowl are an important game bird resource, and the condition and numbers of the yearly flocks passing through the Great Basin region are dependent upon the status of both the summer nesting areas in Alaska and Canada and the major wintering areas in Mexico and Central America. Water conditions in these areas are among the key factors in determining the available populations in Nevada and resultant bag limits and hunting season lengths. Major waterfowl use areas are shown in Figure 1.1-8. Water in the Great Basin is vital as resting and foraging areas for these birds, and there is some nesting in areas such as Stillwater, Ruby Marsh, and Humboldt River (Walstrom, 1973). Prime waterfowl habitat is easily impacted by water management practices in storage reservoirs including increased recreational use and the overall demand for available water to meet the needs of increasing urbanization in certain areas.

The Humboldt Sink-Toulon Lake area and the Stillwater-Lahontan Valley areas are both prime waterfowl habitats, particularly as resting or staging areas. These habitats could be altered in the future: the Stillwater-Lahontan Valley by changed water allocations on the Truckee and Carson Rivers, the Humboldt Sink-Toulon Lake area by upstream storage reservoirs.

Swan populations should remain stable as long as key habitat such as the Stillwater Wildlife Management Area in the Lahontan Valley is maintained and Arctic breeding grounds remain intact.

Goose populations are highest in the western part of Nevada but are subject to increased pressures because of urban development. Geese tend to be more terrestrial than ducks because they graze on land typically in grassy marshes, grain fields, and stubble.

It is estimated that more than one-half million waterfowl use the migration route through Nevada annually (Walstrom, 1973). Spot checks during a hunting season indicate that the top 10 species in the waterfowl game resource in declining order are pintail, mallard, redhead, greenwinged teal, shoveler, gadwall, ruddy duck, American wigeon, canvas back, and cinnamon teal. This tally indicates that the

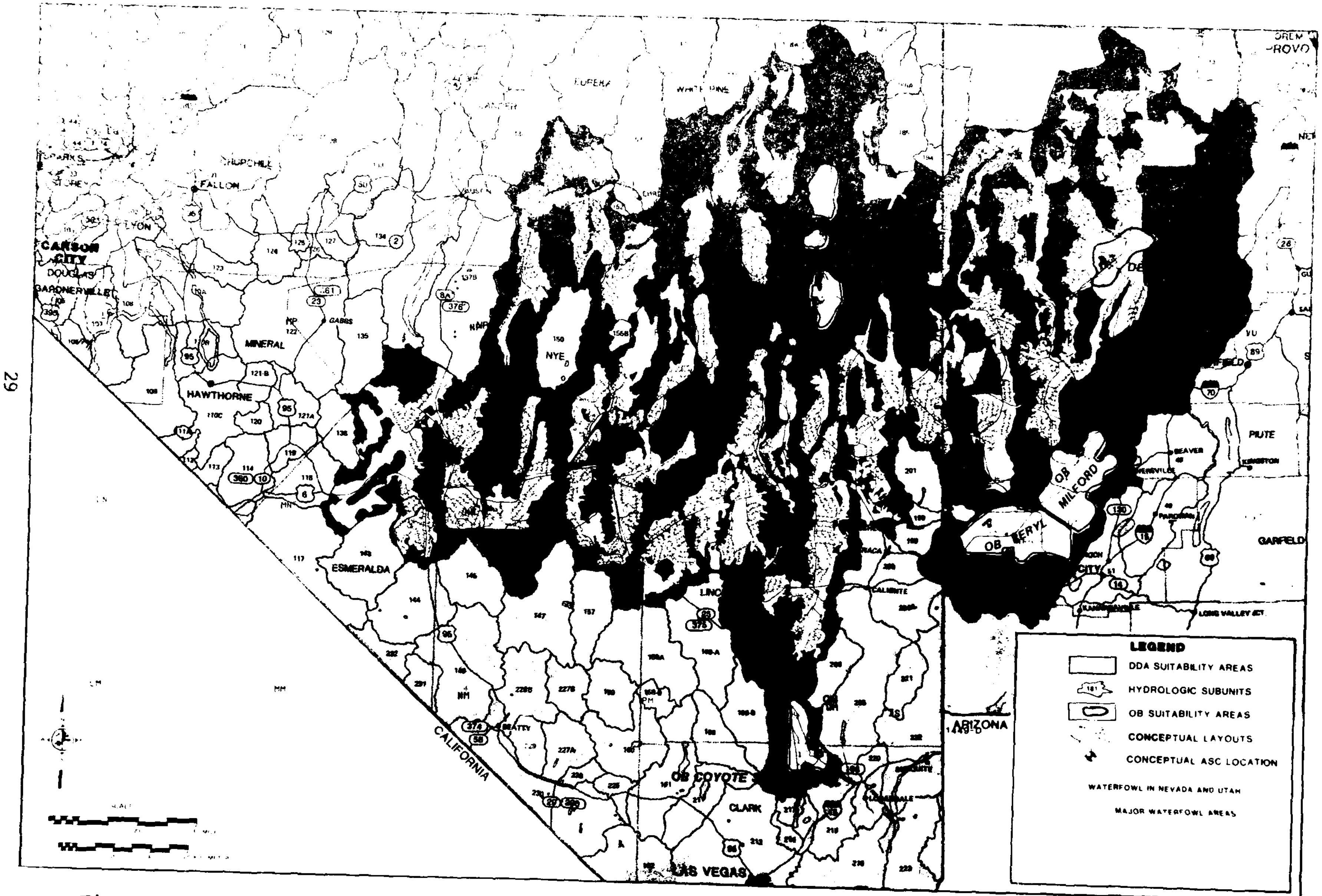

Figure 1.1-8. Major use areas for waterfowl in the Nevada/Utah study area.

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region is particularly important for "puddle ducks" such as redhead and teal which are declining in many other areas of their range.

Although waterfowl habitat is relatively sparse in Nevada, the primary habitat areas in the state have been set aside by state and federal government agencies for the management and use of the waterfowl. This gives a favorable element to waterfowl data projections forecasted until 2220. However, the many small habitat areas scattered throughout Nevada are not protected from drainage projects, urban development, abuse by livestock, and other incompatible uses (Walstrom, 1973). Each of these is of relatively minor importance but collectively they form an important additional waterfowl habitat area.

1.2 WILDLIFE - TEXAS/NEW MEXICO

COMMON AND TYPICAL WILDLIFE

Non-game wildlife in the High Plains study area in Texas and New Mexico lacks diversity in comparison with most other biotic communities that have a wider variety of habitat-types. Appendix Tables 1.6.1-3, 1.6.1-4, and 1.6.1-5 list the common and typical terrestrial wildlife species by habitat type. Examination of these tables shows that short-grass prairie and mesquite-grassland habitat types have relatively low numbers of species. These two habitat types represent the "plains habitat" as commonly perceived. They are characteristic of the western and southern more arid portions of the Great Plains of North America. However, four habitat types that reach their maximum development outside the High Plains do intrude into the study area. These "secondary" habitat types are: (1) riparian, (2) wetland, (3) canyon/upland, and (4) desert scrub. Addition of non-game species characteristic of these "secondary" habitat types increases the diversity of the study area as a whole to levels beyond that expected. The Canadian, Pecos, Red and Brazos River drainages provide riparian habitat. Wetland habitat is represented by the playa lakes that characterize the High Plains. These lakes provide food and cover for much of the observed wildlife on the High Plains. Waterfowl and upland game are especially dependent on these playas, most of which are ephemeral. The 16,000 -200,000 "lakes" can cover as much as one-quarter million surface acres in wet years (Bolen et al., 1979). Many vertebrate species are also relatively abundant in the canyon/upland, which contains trees and brush for cover. The canyon/upland habitat type is best exemplified by the Canadian Breaks in Texas and the edge of the Caprock in New Mexico. The desert scrub habitat type which is restricted largely to the southernmost portions of the study area contributes a unique set of desert adapted species to the overall list.

The species discussed in Appendix Tables 1.6.1-3 1.6.1-4, and 1.6.1-5 range from abundant to relatively rare, depending upon the species, the habitat, and the portion of the study area under consideration. For instance, following a summer rainstorm, there may be tens of thousands of spadefoot toads of two or three species as well as several other species of true toads breeding in the playa lakes. At other times of the year, one might never see a toad. The coyote is common to abundant throughout the region, but the hognosed skunk is relatively common only in restricted habitats in the southern portion of the study area. The thirteen-lined ground squirrel is common in the grassland habitats in the northern portion of the High Plains, while to the south, the Mexican and spotted ground squirrels replace it. The desert shrew is potentially found throughout much of the region, but is nowhere abundant and is only rarely observed by biologists.

Amphibians are most common in the riparian habitat along rivers, but several species, including spadefoot toads and the tiger salamander, are common in and around the playa lakes of the shortgrass habitat. Various toads and some frogs are found in agricultural areas where there are stock watering tanks and irrigation canals. Several of the more ubiquitous amphibian species, including spadefoot toads, the Great Plains toad, and red-spotted toad, are found in moist areas around seasonal or permanent water in the canyon/upland, desert scrub, and mesquite-grassland habitats. No amphibian species is known from the dune-scrub (shinnery oak-sand dunes) habitat type (Appendix Table 1.6.1-3).

Several species of turtles are found in the High Plains, and all but one of these are restricted to aquatic habitats (Appendix Table 1.6.1-3). Most of the species, such as the snapping turtle and painted turtle, are associated with the river drainages. The yellow mud turtle and pond slider are found in more or less permanent pond-like habitats such as some large playa lakes. The ornate box turtle is found in the desert scrub, mesquite grassland, and shortgrass habitat types. In the drier portions of the species' range, ornate box turtles are seen only following the summer rains, apparently spending most of the year underground.

The greatest numbers of lizard species are associated with the drier habitats such as the desert scrub, canyon-upland, and shortgrass habitat types (Appendix Table 1.6.1-3). Only some relatively specialized lizards that require fairly moist, dense cover (skinks) and some ubiquitous generalists (whiptails, earless lizards) are found in riparian habitats. A few lizard species, including the round-tailed horned lizard, leopard lizard, and eastern fence lizard, are adapted to the dune-scrub habitat type.

Four species of snakes, representing fifteen percent of the snake fauna, are likely to be restricted to riparian habitat. These species are the common garter snake, prairie ring-necked snake, Great Plains rat snake, and mottled rock rattlesnake. The latter species is restricted to rocky areas along the Pecos River in the southern portion of the study area. The western blind snake is known only from mesquite grassland in the southern portion of the area (BLM, 1979). The mesquite grassland is known to contain 20 species of snakes (Appendix Table 1.6.1-3), the desert scrub habitat type has 15, and the canyon/upland has 13 species. The dune-scrub is known to contain only six snake species. The western diamond back and the prairie rattlesnake are ubiquitous.

The common and typical species of birds, including migratory waterfowl of the Texas/New Mexico High Plains, are listed in Appendix Table 1.6.1-4, which shows migratory status and habitat types for each species; all aquatic habitats, including the prairie playa lakes, are included under the riparian habitat type. The vast majority of bird species, mainly waterfowl and other water birds, are found in the riparian habitat; waterfowl are discussed below. The bulk of the aquatic species are migrants, either spring or fall, or both. Only 22 species (23 percent) of the aquatic bird species listed have been known to breed in the high plains area.

Among the birds of prey, the goshawk is restricted to riparian habitats during migration through the area. Swainson's and ferruginous hawks have been reported from all habitats in the study area (Appendix Table 1.6.1-4). Turkey vultures are found over much of the area during summer months..

A wide variety of wading and shore birds migrate through the study area. Most species are restricted to riparian/aquatic habitats but a few, such as the mountain plover and upland sandpiper, are found in the shortgrass prairie habitat. The killdeer may be often seen in the vicinity of agricultural operations.

The quail, turkey, pheasant, lesser prairie chicken, and mourning dove are classed as upland game birds and are discussed below. With the exception of the turkey, which is restricted to the canyon/upland habitat type of the eastern portion of the Canadian Breaks, and the prairie chicken, which is strictly a prairie species, these species all tend to be more or less ubiquitous in the study area. The pheasant and bobwhite quail are closely associated with agricultural lands, and the pheasant is closely associated with small playa lakes (Bolen et al., 1979). A few species, such as the short-eared owl, burrowing owl, Sprague's pipit, Lapland longspur, and chestnut-collared longspur, are restricted to short or mixed-grass prairie. Further reductions in remaining natural prairie habitats would be detrimental to these species. The lesser prairie chicken is found in portions of the study area and is hunted in two of the easternmost panhandle counties in Texas (Texas Parks and Wildlife, 1978), and requires undisturbed grasslands for successful reproduction (BLM, 1979). A wide variety of songbirds are found in the various habitat types. Most of the species are migrants; a large percentage are found in riparian habitat types or in the pseudo-riparian situations associated with towns and cities.

The species of mammals considered common and typical in the Texas/New Mexico High Plains are listed and their habitat indicated in Appendix Table 1.6.1-5. Several game species and furbearers also listed in the table are discussed below. The beaver and muskrat are restricted in the study area to portions of the Canadian, Red, and Pecos Rivers. These species are normally classed as furbearers, but their relatively low numbers in the area probably preclude their being utilized as a harvestable resource. Several species of bats utilize riparian and agricultural habitats for roosting and foraging during spring and fall migrations. More than a million Brazilian freetail bats reside in Carlsbad Caverns and forage over nearby range and farmlands.

The High Plains support a variety of rodent species ranging from kangaroo rats and pocket mice in the drier areas to harvest mice and whitefooted mice in more moist locations. Porcupines are known from habitats containing woodland or brushland, and Norway rats and house mice are found in urban and agricultural areas.

The coyote is a widely distributed mammalian predator and prospers in the study area in spite of decades of predator control. The striped skunk is also widespread, while the badger, considered by Shelford (1963) to be an indicator species for the prairie, is apparently restricted to dune-scrub and shortgrass habitats, at least in the southern portions of the study area (BLM, 1979). Both swift and kit foxes are found in the study area. Their ranges tend to be complementary, with kit foxes being found in the more westerly portions and swift fox in the eastern shortgrass habitat type.

Game Animals

Big Game

Four big game species occur in the Texas/New Mexico High Plains. These are mule deer, white-tailed deer, pronghorn, and barbary sheep (aoudad) (Ammotragus lervia). The first three are native species, the fourth is introduced. A fifth big-game species, the javelina (Dicotyles tajacu), occurs in both states south of the study area. Texas has huntable populations of both deer species, the pronghorn, and the aoudad, in or immediately adjacent to the study area (Figures 1.2-1, 1.2-2, and 1.2-3). The aoudad population in Texas is restricted to Palo Duro Canyon. New Mexico has huntable populations of all except the white-tailed deer in the study area. A small population of white-tailed deer occurs in a shinnery oak/dune habitat (Mescalero Sands) in the southern portion of the area (BLM, 1979).

Table 1.2-1 presents the most recent population estimates or transect count data for big game in the study area. In Texas, all populations of big game seem to be holding their own or increasing (Texas Parks and Wildlife, 1978, 1979a,b; 1980a,b,c), and hunter pressure seems to be fairly constant. Virtually all of the game in Texas is on private land and is intensively managed by the landholders and Texas Parks and Wildlife. In the New Mexico High Plains area, there has been some reduction in the numbers of hunters since 1973 (New Mexico Game and Fish, 1977; 1979,b,c; 1980,a) and the game species seem to be in stable condition.

Big game harvest data for Texas and New Mexico during either 1978-79 or 1979-80 are presented in Table 1.2-2. In both states, the aoudad (barbary sheep) harvest has tended to increase as more permits have been issued; the increase in permits has been in response to increased herd size. Deer harvest in both states has remained fairly stable. In New Mexico, there has been a small decline in percent success which somewhat parallels the decline in number of hunters. Pronghorn harvest has tended to be fairly stable in both states.

Upland Game

Eight species of upland game are found in the Texas/New Mexico High Plains. Six of these are birds (mourning dove, bobwhite, scaled quail, pheasant, lesser prairie chicken, turkey) and two are mammals (desert and eastern cottontail).

Mourning dove and scaled quail are found throughout the region. Huntable populations of lesser prairie chickens are restricted to two counties at the extreme east of the panhandle. Figure 1.2-4 shows the distribution of bobwhite, pheasant, and turkey in the study area. Bobwhite and pheasant are closely associated with agriculture and depend, in large measure, on fence rows and rough vegetation around playa lakes for their continued existence. Scaled quail and mourning dove will utilize farmland, but are also common in areas of natural vegetation. Turkeys are restricted to areas of brushland and do not seem to be tolerant of disturbance, especially during the nesting season. Lesser prairie chickens are found primarily in shortgrass habitats.

In New Mexico during the 1978 dove season, 90,000 mourning dove were harvested in the study area (New Mexico Game and Fish, 1980b). Dove harvest in New Mexico, as a whole, has remained relatively stable since 1957, with an average

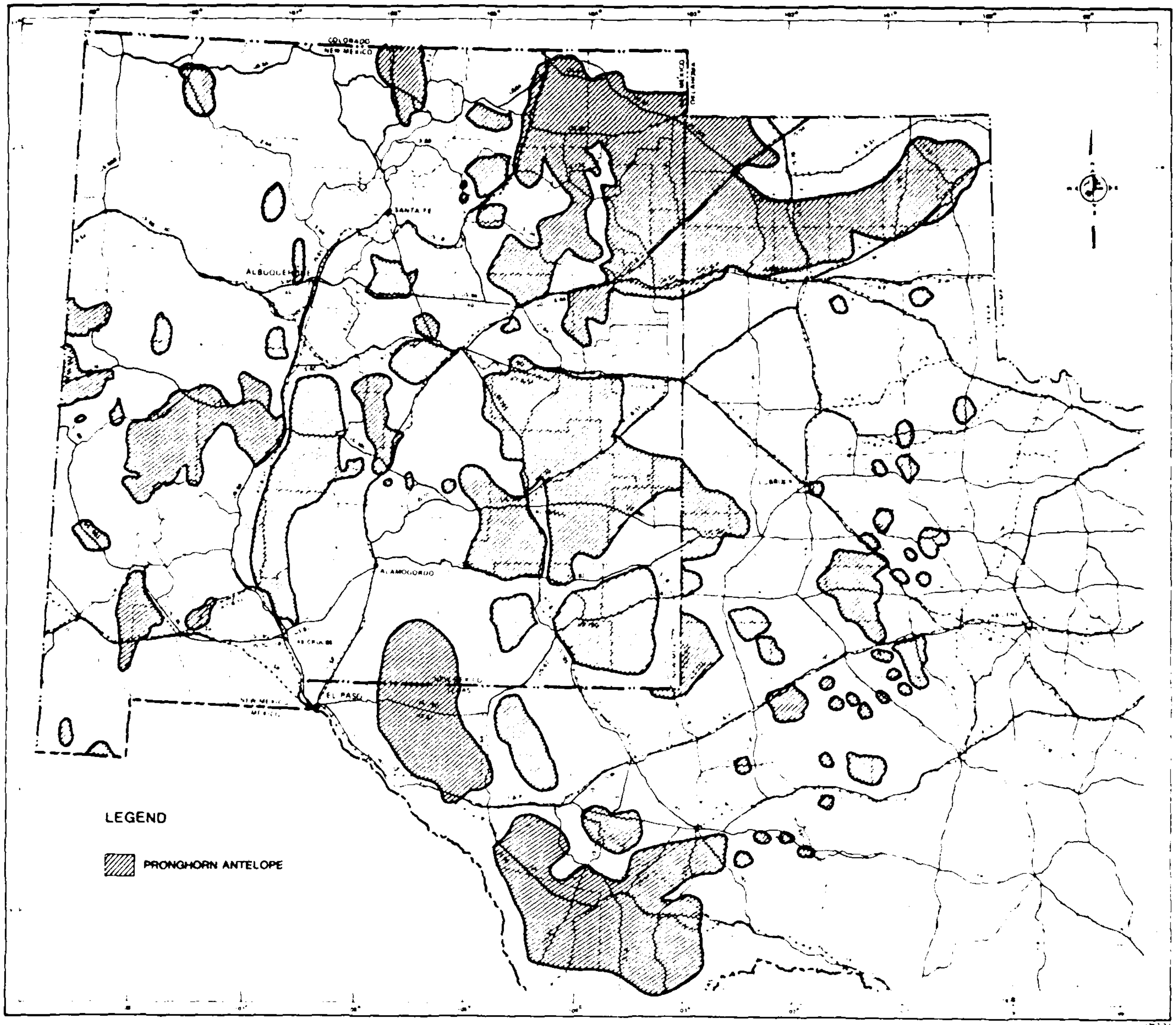

Figure 1.2-1. Pronghorn antelope range in the Texas/New Mexico study area.

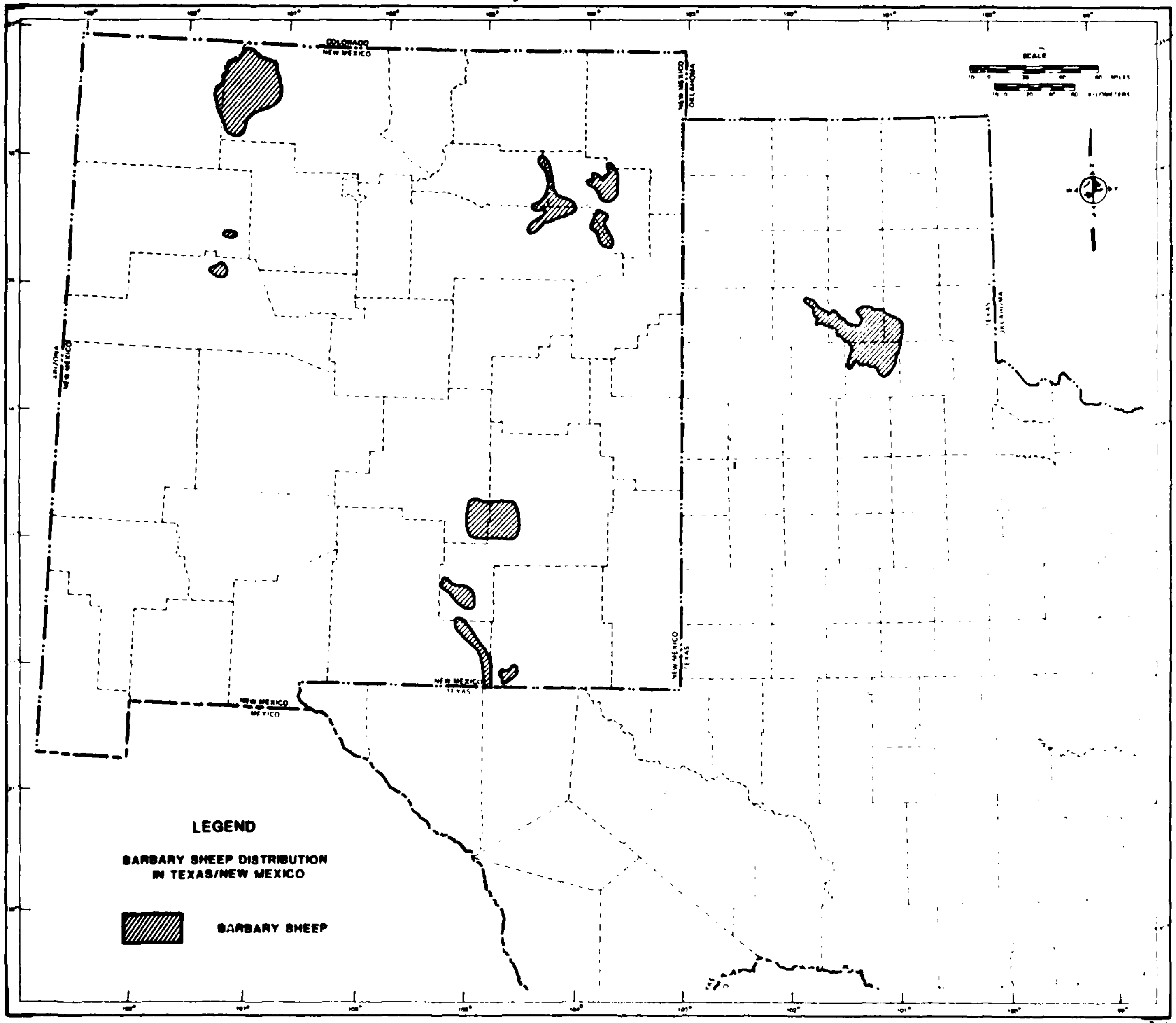

Figure 1.2-2. Barbary sheep (aoudad) distribution in the Texas/New Mexico study area.

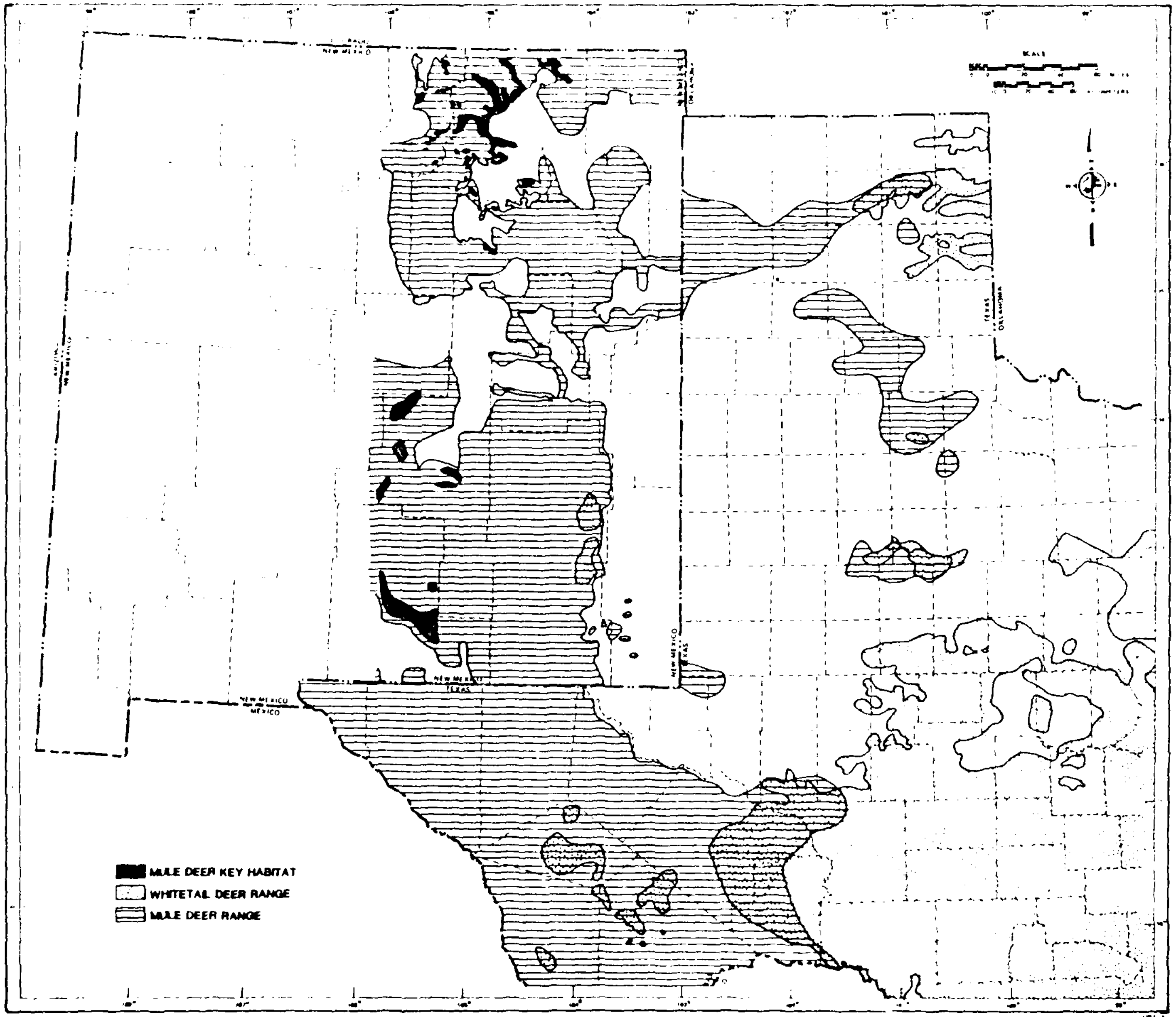

Figure 1.2-3. Mule deer and white tailed deer distributions in Texas and New Mexico.

Table 1.2-1. Big game prehunt population estimates for Texas/New Mexico High Plains by species and state.[1]

SPECIES	YEAR	NO. MALE	NO. FEMALE	NO. IMMATURE	TOTAL
Texas					
White-tail Deer	1979	—	—	—	1,590[3]
Mule Deer	1978	—	—	—	19,014
Pronghorn	1978[7]	1,362	2,642	555	4,559
Aoudad*	1977	167	233	127	788[4]
New Mexico					
Mule Deer	1978	124[5]	826[5]	417[5]	1,458[4,5]
Pronghorn	1978[6]	144[5]	550[5]	2[5]	699[4]
Barbary Sheep*	1977[2]	48[2]	132[2]	42[2]	226[4]

1188

*Aoudad *(Ammotragus lervia)*.

[1]Data compiled from reports of Texas Parks and Wildlife and New Mexico Game and Fish.

[2]Data totals from all huntable herds, regardless of area.

[3]Data for high plains ecological area as defined by Texas Parks and Wildlife.

[4]Estimate includes animals of unknown sex/age.

[5]Direct count data from transects.

[6]Northeast and southeast management areas combined.

[7]Data for Panhandle regulatory district.

Table 1.2-2. Big game harvest by species and state for the Texas/New Mexico High Plains study area.[3]

SPECIES	1979-80 HARVEST	NO. HUNTERS	PERCENT SUCCESS
Texas			
White-tail Deer	149[2]	817[4]	18
Mule Deer	649	1,064	61
Pronghorn[3]	313	380	72
Barbary Sheep*	166	578	29
New Mexico			
Mule Deer	3,988	23,459	17
Pronghorn	1,341[4]	1,921[4]	70
Barbary Sheep*	93[5]	206[5]	45

1189

*Aoudad *(Ammotragus lervia)*.

[1]Data extracted from Texas Parks and Wildlife and New Mexico Game and Fish reports.

[2]Data from high plains ecological area as defined by Texas Parks and Wildlife.

[3]Data from 1978 season in Panhandle regulatory district.

[4]Northeast and southeast management areas combined.

[5]Totals from entire huntable population, regardless of area.

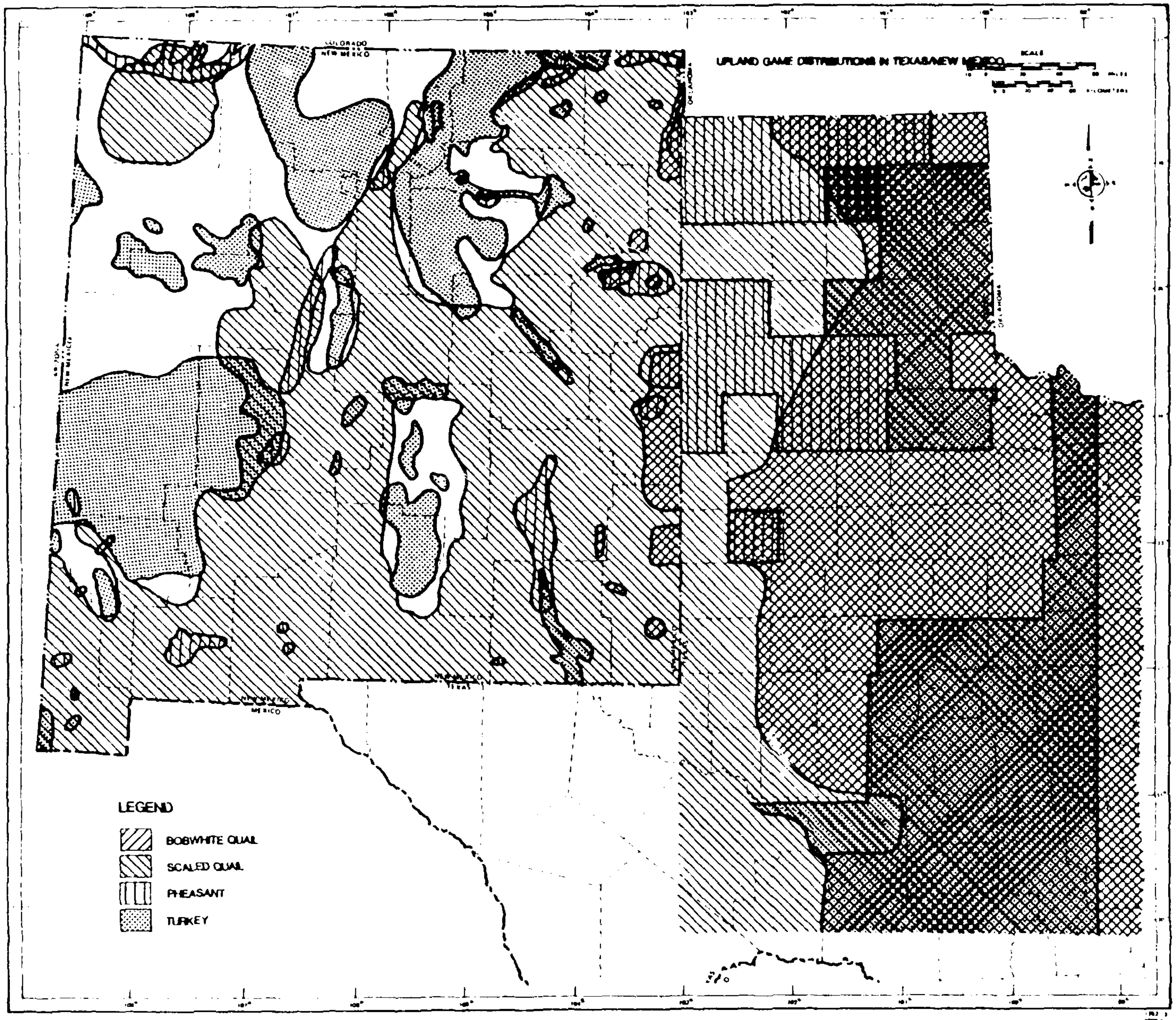

Figure 1.2-4. Upland game distributions in the Texas/New Mesico study area.

of 267,200 birds being harvested each year. In 1978, there were 86,200 scaled quail harvested in the New Mexico portion of the study area. The 22-year average statewide quail harvest is 223,500 per year. The quail harvest has fluctuated over time, but shows no clear trend of decline or increase. During the 1978 pheasant season in New Mexico, 3,600 pheasant were harvested from the study area. For the state as a whole, the pheasant harvest has increased since 1957 and the statewide 22-year average is 4,600 birds. Lesser prairie chickens are hunted in the New Mexico portion of the study area and 1,200 birds were harvested in 1978. The populations of prairie chickens have fluctuated considerably over time, but there is no clear trend at present toward increase or decline. However, the 1978 harvest was 32.6 percent lower than the 1979 harvest. The 21-year average prairie chicken harvest is 1,125 birds.

Harvest results for the 1976-1977 hunting season for upland game species in Texas indicate that 87 lesser prairie chicken were harvested in the study area, with 65 percent hunter success. In addition, 17,800 pheasants were taken, with 56 percent hunter success (Texas Parks and Wildlife, 1978). As a rule for most upland game species, harvest trends are a good indicator of population trends.

Furbearers and Predators

Beavers are found in the New Mexico portion of the study area along the drainages of the Pecos, Brazos, Red, and Canadian Rivers. The populations tend to be relatively small and restricted. Some of the populations show a declining trend, but most are either stable or showing some increase. Along the Pecos River, habitat is declining. Muskrat distribution and population trends in the New Mexico part of the study area essentially parallel those of beaver.

Raccoons are found throughout the study area, and the populations in New Mexico are either stable or show an increasing trend. Ringtail cats rarely appear in the study area, since they prefer canyon and brushlands. There are no available data on trends of the limited populations.

Badgers occur over most of the study area; the populations generally appear to be stable. Striped skunk populations are similar in distribution to badger and are also stable. Some skunk populations are showing an increasing trend.

Coyote populations in the New Mexico portion of the study area all show an increasing trend. Similar trends undoubtedly occur in Texas. Domestic sheep production in the southern portion of the study area has brought this predator into increasing conflict with ranchers. Erection of coyote-proof fencing, while protecting sheep, has caused problems in management of the antelope herds in the area. A number of ongoing studies are seeking ways out of the dilemma (BLM, 1979; V.W. Howard, 1980). Gray fox populations in the study area appear to be stable or increasing, especially in areas with relatively natural vegetation. Kit and swift fox populations are either stable or declining in the study area. Swift fox has been nearly extirpated in many areas of the species' range and is nowhere considered abundant. Kit fox has fared somewhat better, but the population status of the species in many parts of its range is unknown.

Bobcats are variously regarded as either predators or furbearers. Due to current world demand, prime bobcat pelts can bring in excess of $300. This market

demand has increased trapping pressure on bobcats to the point where numerous state regulatory and federal wildlife agencies are concerned about the status of the species. During the 1977-78 reporting period an estimated 2,200 bobcats were harvested in the panhandle district of Texas (Brownlee, 1978).

In New Mexico, bobcat populations generally seem stable in the High Plains area. In the southernmost portions of the New Mexico area, bobcat populations are increasing. There are no harvest data available for bobcats in New Mexico.

Waterfowl

The High Plains of Texas and New Mexico are on the central flyway and host many species of migratory waterfowl (Lincoln and Peterson, 1979). The numerous playa lakes are heavily utilized, as are stretches of the various rivers that dissect the area. There are several national wildlife refuges (NWR) in and near the area, including Muleshoe, Maxwell, Las Vegas, Grulla, Buffalo Lake, and Bitter Lake. All of these refuges are important wildlife habitat but their central purpose is to provide high-quality waterfowl habitat. For instance, Muleshoe NWR may host in excess of 700,000 waterfowl at the peak of the migration in late December (U.S. FWS, 1973). Table 1.2-3 presents data on waterfowl and other species' use of four of the refuges during 1979.

1.3 PROJECT IMPACTS

This section discusses the methodologies used in impact analysis and discusses impacts in two parts. First, significant impacts to certain key wildlife resources are evaluated by project alternative. Treated in this section are the major impacts to pronghorn, bighorn sheep, sage grouse, waterfowl, and lesser prairie chicken.

Following these discussions are evaluations of potential project effects on wildlife in general. This section evaluates resources which may be considered significant but are not significantly impacted. This text is organized by project region because of dissimilarities in physical environment, biotic environment, and history of disturbance in the two project regions.

METHOD OF ANALYSIS (1.3.1)

This section outlines the methodology used to analyze impacts upon wildlife species in both the Nevada/Utah and Texas/New Mexico potential deployment areas. The first step in the analysis consisted of overlaying maps of the conceptual deployment of the DDA and OB sites on baseline data maps (scale: 1:500,000) showing the distribution, key habitats, and migration routes of major wildlife species (maps from state wildlife agencies). Two kinds of effects can occur to wildlife; direct and indirect. Direct effects consist of permanent loss of habitat or required resources due to construction activities, or loss of habitat due to behavioral avoidance of areas adjacent to construction and human activity. Direct effects have short and long-term aspects. Short-term effects are those that occur during construction. For most wildlife species, this is likely to be the time when adverse impacts are the most severe. Long-term effects are those that occur during and after the operational phase of the M-X system. Construction would be complete, the human population present would be reduced in the DDA, and some disturbed habitats may recover. Long-term negative effects are expected to be less than short-term effects for most species.

Table 1.2-3. Waterfowl and other species' use of four national wildlife refuges in the Texas/New Mexico High Plains during 1979.[1]

REFUGE	DUCKS[3]	GEESE[3]	COOTS[3]	MARSH & WATER BIRDS[4]	SHOREBIRDS, GULLS AND TERNS[4]
Maxwell NWR	473,460	409,500	209,430	8,473	44.891
Las Vegas NWR	131,580	208,980	85,290	13,639	20,804
Grulla NWR	6,750	1,350	0	1,351,217[2]	11,198
Bitter Lake NWR	4,518,060	600,690	872,580	304,377	66,996

1190

[1]USFWS, 1980,a,b,c,d.

[2]Almost entirely lesser sandhill cranes.

[3]Data total for 1979 calendar year.

[4]Data total for 1979 fiscal year.

Direct effects were calculated by counting the number of M-X shelters and measuring the length of roads (DTN and cluster) within each hydrologic subunit that intersected range, key habitat, and migration routes of major wildlife species. The number of shelters that intersected a wildlife feature was converted to number of acres using a factor of 10 acres per shelter and road length converted to area using a width of 100 feet. The number of migration routes directly removed by the project configuration were counted. These were compared to the total habitat or number of migration routes in the hydrologic subunit and a percentage was calculated. The amount of added area that would result from behavioral avoidance of disturbances could only be estimated for certain species. In those cases a radius of effect was used to outline the DDA clusters and DTN, and this added area was incorporated into the amount of habitat directly lost. For a more detailed explanation of the calculation of direct effects see Appendix 1.6.2 (Quantification of Direct Effects of M-X Deployment on wildlife in Nevada/Utah). For direct effects at the OB locations, a habitat loss of 6,000 acres (primary base) or 4,500 acres (second base) was used.

Indirect effects are primarily people-related, resulting from an increased human population (numbers from human environment sections of this EIS) with attendant recreation activities. Since long-term effects related to people would be closely associated with the OB sites, indirect effects analysis concentrated there. The basic tenet of the analysis is that the intensity of recreation activities decreases with distance from an OB site. A model was developed to mathematically predict the intensity of human use with distance from the OB. The population of the OB and recreational attractants (e.g., parks) were factored into the calculations. For a detailed explanation of the indirect effects model see ETR-30 (Indirect Effects Index for Impact Analysis).

Pronghorn Antelope

Impact analysis was performed in three steps: (1) a description of project effects on pronghorn, (2) an assessment of the impact (all effects combined) to pronghorn, and (3) a determination of the significance of the impact. Direct and indirect effects were determined by combining baseline information presented previously in this technical report with project information. (Appendix 1.6.4 contains questionnaires used to help in this analysis.) These effects result primarily from construction activities, water use, and recreation activities of project-related people. We assumed that direct impacts to pronghorn populations would occur wherever habitat was lost, even if only temporarily (on the order of one year). Since field observations and discussions with wildlife managers indicate that pronghorn will avoid areas up to a distance of about 1 mile (1.6 km) from sites under construction, short-term habitat loss in the DDA was calculated as both the area directly involved in construction and the area within one mile (1.6 km) of construction. Long-term habitat loss was calculated as only that area which would be directly involved in construction (where vegetation is lost). The method and results of these calculations are presented in Appendix 1.6.2.

The level of direct impact was ranked as low, moderate, or high. A rank of high was assigned when construction activities were in key habitat or when short-term habitat loss exceeded 50 percent of the known range (excluding key habitat). A rank of moderate indicated a short-term loss of 26 to 50 percent of pronghorn range or a long-term loss of any key habitat. Loss of less than 26 percent of pronghorn range or if pronghorn were not present was assigned a rank of low.

Indirect impacts are more difficult to quantify than are direct impacts. Short-term, indirect impacts in the Nevada/Utah full basing DDA were ranked (Table 1.3.1-1) using construction camp location in relationship to pronghorn distribution and abundance, but the values did not change the general level of impact determmined for direct effects. Similar analyses were not conducted for the Texas/New Mexico DDA (since many of the pronghorn herds are on private land) or for the split basing alternative. Long-term indirect impacts attributable to project activities in the DDA, excluding operating base effects, are expected to be negligible.

Direct impact to pronghorn could result from OB construction at all the proposed sites, except Coyote Spring (Nevada) and Clovis (New Mexico), since the OB suitability area encompasses range and sometimes key habitat. The potential for direct impact was estimated using the conceptual base layouts in the OB suitability area. If any key habitat or more than 50 percent of the range in a hydrologic subunit would be lost, a high potential for impact was assigned, while loss of 26 to 50 percent of range (excluding key habitat) was rated as moderate. In addition, the impact potential was considered moderate if any key habitat was present in the OB suitability zone but not directly affected by the conceptual OB layout, as it could be directly affected if the OB location in the zone were moved. Low potential for impact would occur where construction activities affect less than 26 percent of range. The results of this analysis are presented in Table 1.3.1-2. They did not change any of the indirect impact predictions (see below) so the latter were presented as overall OB impacts.

Indirect effects on pronghorn are expected to occur as a result of increased human population in the vicinity of the OBs, primarily because of recreation and illegal harvest. The distribution of people in the vicinity of each OB and both OBs combined for each alternative was estimated by the model described in ETR-30. Most effects were assumed to occur wihtin 70 mi (112 km) of the OB although the combined effect of people attracted to the vicinity of one OB from the other was included. The indirect effect index derived from the model was used to rank effects: high effect = index value greater than 10,000, moderate effect = 1,000 to 10,000, and low effect = less than 1,000). These ranks were then combined with the abundance indexes to determine impact potential. High impact potential was defined as high or moderate effect index values combined with presence of key habitat while a moderate impact potential was assigned for a moderate or high effect index value in combination with the presence of range only. Low impact potential indicated a low effect index value and range only or no pronghorn present. These analyses are presented in Table 1.3.1-3. Overall impact potential was defined as high if high potential for impact occurred in more than half the hydrologic subunits containing pronghorn.

At what level impact becomes significant is a value judgement. Pronghorn are a prized game species with a high aesthetic appeal, and thus, any reduction in their numbers resulting from M-X deployment would be perceived as a significant impact by many people. In this analysis, a high potential for impact was assumed to be significant. For short-term impacts this is probably conservative since moderate impacts could cause a decrease in pronghorn numbers. For long-term impacts, however, it is probably a worst case estimate because loss of very small amounts of key habitat (less than 0.1 percent) may not reduce pronghorn abundance.

Table 1.3.1-1. Short-term indirect impact potential to pronghorn in the Nevada/Utah DDA for the Proposed Action and Alternatives 1-6.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	ABUNDANCE INDEX	INDIRECT EFFECT INDEX
4	Snake	3	3
5	Pine	3	3
6	White	3	2
7	Fish Springs	3	2
8	Dugway	3	2
9	Government Creek	3	1
46	Sevier Desert	3	2
46A	Sevier Desert-Dry Lake	3	1
54	Wah Wah	3	2
137A	Big Smoky-Tonopah Flat	1	1
139	Kobeh	3	2
140A	Monitor-Northern	2	1
140B	Monitor-Southern	1	1
141	Ralston	3	2
142	Alkali Spring	1	1
148	Cactus Flat	3	1
149	Stone Cabin	3	3
151	Antelope	2	2
154	Newark	1	1
155A	Little Smoky-Northern	1	1
155C	Little Smoky-Southern	2	1
156	Hot Creek	3	2
170	Penoyer	2	1
171	Coal	1	1
172	Garden	1	1
173A	Railroad-Southern	3	3
173B	Railroad-Northern	3	3
174	Jakes	1	1
175	Long	1	1
178B	Butte-South	1	1
179	Steptoe	3	1
180	Cave	1	1
181	Dry Lake	1	1
182	Delamar	1	1
183	Lake	3	3
184	Spring	3	2
196	Hamblin	3	2
202	Patterson	3	2
207	White River	1	1
208	Pahroc	1	1
209	Pahranagat	1	1

4117

1 = No pronghorn present, low indirect effect index (no construction camp present or access to pronghorn range poor).

2 = Pronghorn range only present, moderate indirect effect index (easy access from construction camp to pronghorn habitat with low to moderate abundances).

3 = Pronghorn key habitat present, high indirect effect index (construction camp in or adjacent to key habitat and areas of high pronghorn abundance).

Table 1.3.1-2. Potential direct impact to pronghorn resulting from construction and operation of M-X operating bases.

HYDROLOGIC SUBUNIT/ COUNTY		ABUNDANCE INDEX[1]	OPERATING BASE																					
			BERYL			COYOTE			DELTA			ELY			MILFORD			CLOVIS			DALHART		
NO.	NAME		R[2]	K[3]	I[4]	R	K	I	R	K	I	R	K	I	R	K	I	R	K	I	R	K	I
46	Sevier Desert	3							1	1	1												
46A	Sevier Desert-Dry Lake	3							2	1	1												
50	Milford	3													2	3	3						
52	Lund District	3	3	2	2										3	2	2						
53	Beryl-Enterprise	2	4	2	2																		
179	Steptoe	3										2	2	2									
210	Coyote Spring	1				0	1	1															
219	Muddy River Springs	1				0	1	1															
	Curry, NM	1																0	1	1			
	Hartley, TX	2																			1	1	1

4118

[1,3,4]1 = Low impact. (No range or key habitat present for Abundance Index.)

2 = Moderate impact. (Range present for Abundance Index.)

3 = High (significant) impact. (Key habitat present for Abundance Index.)

[2]Percentage of range lost, calculated by dividing 6,000 acres (maximum potential range loss in any hydrologic subunit or county) by the total acreage of range in the hydrologic subunit or county (figures from Appendix A).

[4]Total direct impact. High = any loss of key habitat or more than 50 percent of range. Moderate = loss of 26-50 percent of range or key habitat in OB suitability zone, and Low = loss of less than 26 percent of range.

Table 1.3.1-3. Potential indirect impacts to pronghorn resulting from construction and operation of M-X operating bases for the Proposed Action and Alternatives 1-8.

HYDROLOGIC SUBUNIT/COUNTY		ABUNDANCE INDEX[1]	PA & ALT. 6		ALT. 1 & 4		ALT. 2		ALT. 3		ALT. 5		ALT. 7		ALT. 8	
			COYOTE/ MILFORD		COYOTE/ BERYL		COYOTE/ DELTA		BERYL/ ELY		MILFORD/ ELY		CLOVIS/ DALHART		COYOTE/ CLOVIS	
NO	NAME		IFI[2]	IMPACT[3]	IFI[2]	IMPACT[3]	IFI[2]	IMPACT[3]	IFI[2]	IMPACT[3]	IFI[2]	IMPACT[3]	IFI[2]	IMPACT[3]	IFI[2]	IMPACT[3]
Subunits or Counties within OB Suitability Area																
46	Sevier Desert	3					3	3								
46A	Sevier Desert-Dry Lake	3					3	3								
50	Milford	3	3	3							3	3				
52	Lund District	3	2	3	3	3			3	3	3	3				
53	Beryl-Enterprise	2			3	2			3	2						
179	Steptoe	3							3	3	3	3				
210	Coyote Spring	1	1	1	1	1	1	1							1	1
219	Muddy River Spring	1	1	1	1	1	1	1							1	1
	Curry, NM	1											1	1		
	Hartley, TX	2											1	1		
Other Affected Subunits																
4	Snake	3					3	3	3	3	3	3				
5	Pine	3	2	3	2	3	2	3	3	3	3	3				
6	White	3					3	3								
7	Fish Springs	3					2	3								
8	Dugway	3					2	3								
9	Government Creek	3					2	3								
49	Parowan	2	3	2	3	2			3	2	3	2				
50	Milford	3			2	3			2	3						
51	Cedar City	3			2	3			2	3	3	3				
53	Beryl-Enterprise	2	3	2									3	2		
54	Wah Wah	3	2	3	2	3	2	3	2	3	3	3				
155	Little Smoky - N & S	2							2	2	2	2				
183	Lake	3			3	3			3	3	3	3				
184	Spring	3							3	3	3	3				
185	Tippet	3							2	3	2	3				
196	Hamblin	3	3	3	3	3			3	3	3	3				
202	Patterson	3			3	3			3	3						
	Overall Impact			3		3		3		3		3		1		1

4120

[1] 1 - Low index or impact and no pronghorn present

2 - Moderate index or impact and pronghorn range present

3 - High index or impact and pronghorn key habitat present

[2] IFI - Indirect Effect Index as described in ETA 30.

[3] High (significant) impact - high or moderate IFI and key habitat present, moderate impact - high or moderate IFI and range only present, and low impact - low IFI.

Bighorn Sheep

Impact analysis for bighorn sheep was performed by combining information about the project and bighorns (e.g., range, abundance, and habitat requirements) presented in the first section of this technical report. Direct effects would occur whenever any habitat is lost or any migration routes are crossed while indirect effects would be most likely to occur where construction camps (more than 1,000 people) are within 25 miles (40 km) of bighorn habitat and within 35 mi (56 km) of the operating base. Appendix 1.6.4 contains a questionnaire used to aid in impact analysis.

An overlay of the conceptual project layout on bighorn sheep distribution indicated that no direct effects would be expected in the DDA, other than the DTN segment from the Coyote Spring OB which crosses a migration route between the Sheep Range and Delamar Mountains. Since this is related to the OB location it was considered in the OB analysis rather than the DDA analysis. Indirect effects, however, could occur in several locations. Construction camps would be within 25 mi (40 km) of bighorn habitat in the Snake Range (transplant sites), Grant Range (100 sheep), Lone Mountain (146 sheep), and Delamar Mountains (50 sheep). Potential effects at these locations would be short-term since once construction is completed, few project-related people would be presented in the DDA. Level of potential impact was estimated by combining the effect index and abundance data. A high index value with either a moderate or high abundance was designated as high impact potential while moderate index and abundance values were given a moderate impact potential rating (Tables 1.3.1-4 and 1.3.1-5). A high overall potential for impact in the DDA was assigned since a high value occurred in more than 50 percent of the hydrologic subunits containing bighorn sheep.

The potential for direct effects to bighorn sheep from operating base siting exists only at the Coyote Springs location. The OB suitability zone encompasses small portions of bighorn range in the Delamar Mountains, Meadow Valley Mountains, Arrow Canyon Range, and Las Vegas Range. The proposed locations of base facilities is not within bighorn range, but the base community center complex is. In addition, the migration route between the Arrow Canyon Range and the Meadow Valley Mountains may be crossed by a road connecting the base community and the OB. Habitat loss would cause long-term effects, but this could be mitigated by moving the base community so as to avoid bighorn habitat. Thus, direct effects of the Coyote Spring OB are expected to be minimal and were not analyzed separately from the indirect effects.

Indirect effects of concern which would alter normal behavioral patterns of bighorn sheep include recreation activities of the large number of people drawn to the area because of the project, illegal harvest of bighorn sheep, and increased traffic-related mortalities where roads cross migration routes. Most effects were assumed to occur within approximately 35 mi (56 km) of the base since accessibility to their habitat is generally limited by poor quality roads. Using the Indirect Effect Index derived from a model discussed in ETR-30, each hydrologic subunit with an average distance of less than 35 mi (56 km) from the OB was given an indirect effect index rank (high = greater than 10,000, moderate = 1,000 to 10,000, and low = less than 1,000). These ranks were then combined with the abundance indexes to determine potential for impact. High effect and abundance indexes were given a high impact potential while a moderate abundance and high effect index indicated

Table 1.3.1-4. Potential impact to bighorn sheep in Nevada/Utah DDAs for the Proposed Action and Alternatives 1-6.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	ABUNDANCE INDEX	SHORT-TERM INDIRECT EFFECT INDEX	SHORT-TERM IMPACTS	LONG-TERM INDIRECT EFFECT INDEX	LONG-TERM IMPACTS
	Subunits with M-X Clusters and DTN					
4	Snake	2	3	3	1	1
5	Pine	1	1	1	1	1
6	White	1	1	1	1	1
7	Fish Springs	1	1	1	1	1
8	Dugway	1	1	1	1	1
9	Government Creek	1	1	1	1	1
46	Sevier Desert	1	1	1	1	1
46A	Sevier Desert-Dry Lake	1	1	1	1	1
54	Wah Wah	1	1	1	1	1
137A	Big Smoky-Tonopah Flat	3	3	3	1	1
139	Kobeh	1	1	1	1	1
140A	Monitor-Northern	1	1	1	1	1
140B	Monitor-Southern	1	1	1	1	1
141	Ralston	1	1	1	1	1
142	Alkali Spring	1	1	1	1	1
148	Cactus Flat	1	1	1	1	1
149	Stone Cabin	1	1	1	1	1
151	Antelope	1	1	1	1	1
154	Newark	1	1	1	1	1
155A	Little Smoky-Northern	1	1	1	1	1
155C	Little Smoky-Southern	1	1	1	1	1
156	Hot Creek	1	1	1	1	1
170	Penoyer	1	1	1	1	1
171	Coal	1	1	1	1	1
172	Garden	2	3	3	1	1
173A	Railroad-Southern	1	1	1	1	1
173B	Railroad-Northern	2	3	3	1	1
174	Jakes	1	1	1	1	1
175	Long	1	1	1	1	1
178B	Butte-South	1	1	1	1	1
179	Steptoe	1	1	1	1	1
180	Cave	1	1	1	1	1
181	Dry Lake	1	1	1	1	1
182	Delamar	2	3	3	1	1
183	Lake	1	1	1	1	1
184	Spring	2	3	3	1	1
196	Hamblin	1	1	1	1	1
202	Patterson	1	1	1	1	1
207	White River	1	1	1	1	1
208	Pahroc	1	1	1	1	1
209	Pahranagat	2	1	1	1	1
	Overall DDA Impact			3		1

4116

1 = No bighorn sheep present, low indirect effect index (less than 1,000 in model described in ETA 30), low impact.

2 = Less than 150 bighorn sheep present, moderate indirect effect index (1,000 to 10,000), moderate impact (moderate abundance and effect indexes).

3 = More than 150 bighorn sheep present, high indirect effect index (over 10,000), high impact (high effect index and high or moderate abundance).

Table 1.3.1-5. Potential impact to bighorn sheep in Nevada/Utah DDA for Alternative 8.

HYDROLOGIC SUBUNIT COUNTY NO.	NAME	ABUNDANCE INDEX[1]	SHORT-TERM INDIRECT EFFECT INDEX[1]	SHORT-TERM IMPACTS[1]	LONG-TERM INDIRECT EFFECT INDEX[1]	LONG-TERM IMPACTS[1]
	Subunits/Counties with M-X Clusters and DTN					
4	Snake	2	3	3	1	1
5	Pine	1	1	1	1	1
6	White	1	1	1	1	1
7	Fish Springs	1	1	1	1	1
46	Sevier Desert	1	1	1	1	1
46A	Sevier Desert-Dry Lake	1	1	1	1	1
54	Wah Wah	1	1	1	1	1
155C	Little Smoky-Southern	1	1	1	1	1
156	Hot Creek	1	1	1	1	1
170	Penoyer	1	1	1	1	1
171	Coal	1	1	1	1	1
172	Garden	2	3	3	1	1
173A	Railroad-Southern	1	1	1	1	1
173B	Railroad-Northern	2	3	3	1	1
180	Cave	1	1	1	1	1
181	Dry Lake	1	1	1	1	1
182	Delamar	2	3	3	1	1
183	Lake	1	1	1	1	1
184	Spring	2	3	3	1	1
196	Hamblin	1	1	1	1	1
202	Patterson	1	1	1	1	1
207	White River	1	1	1	1	1
	Bailey, TX	1	1	1	1	1
	Cochran, TX	1	1	1	1	1
	Dallam, TX	1	1	1	1	1
	Deaf Smith, TX	1	1	1	1	1
	Hartley, TX	1	1	1	1	1
	Hockley, TX	1	1	1	1	1
	Lamb, TX	1	1	1	1	1
	Oldham, TX	1	1	1	1	1
	Parmer, TX	1	1	1	1	1
	Chaves, NM	1	1	1	1	1
	Curry, NM	1	1	1	1	1
	De Baca, NM	1	1	1	1	1
	Guadalupe, NM	1	1	1	1	1
	Harding, NM	1	1	1	1	1
	Lea, NM	1	1	1	1	1
	Quay, NM	1	1	1	1	1
	Roosevelt, NM	1	1	1	1	1
	Union, NM	1	1	1	1	1
	Overall DDA Impact			3		1

4121

[1] 1 = No bighorn sheep present (abundance index), low indirect effect index (less than 1,000 in model described in ETR 30), low impact.

2 = Less than 150 bighorn sheep present, moderate indirect effect index (1,000 to 10,000), moderate impact (moderate abundance and effect indexes)

3 = More than 150 bighorn sheep present, high indirect effect index (over 10,000), high impact (high effect index and high or moderate abundance)

moderate impact potential. All other combinations were assumed to have low impact potential. These are summarized in Table 1.3.1-6 for the Coyote Spring OB vicinity. Impact potential was low at all other OB locations. Overall impact potential for the OB vicinity was rated high for the Coyote Springs area since more than half the hydrolgoic subunits containing bighorn range showed high potential for impact.

Significance of impact is a value judgement. Since bighorn sheep are an important game species and have a high aesthetic appeal, any loss of bighorns, direct or indirect, will be perceived by many people as signficant. For this analysis, a high potential for impact was assumed to be significant. This is a worst case prediction since much of the bighorn habitat is relatively inaccessible to humans or occurs in areas with no other attractive features, such as fishable streams or camping facilities. The close proximity of several developed recreation areas (e.g., Lake Mead, Valley of Fire State Park, and Las Vegas) would tend to attract people much more so than many of the fairly arid mountain ranges inhabited by bighorn sheep.

Sage Grouse

Direct impacts to known sage grouse habitat were estimated from the intersections of known sage grouse range and key habitat (strutting grounds (leks), brood use areas, and, wintering grounds) with project elements on 1:500,000 scale maps (1" = 8 miles). Data were obtained from Nevada Department of Wildlife and Utah Division of Wildlife Resources.

Short-term (construction) effects involve both direct habitat disturbance and an avoidance factor of up to 1 mi from the disturbance. At the map scale used in this analysis, the size of both key habitat and construction may cause abandonment of key habitat up to 1 mi from the disturbance. At the map scale used in this analysis, the size of both key habitat and construction sites are exaggerated, causing an overestimate of numbers of strutting grounds and brood use sites impacted. This allows for the short-term behavioral avoidance, but is probably an overestimate of direct impacts.

Long-term effects are assumed to be proportional to the key habitat area actually disturbed by the project and would thus be lower than for short-term effects in which behavioral avoidance is a factor. Because of the overestimation of habitat loss caused by the analysis scale, long-term effects are overestimated and thus must be considered a worst case estimate.

Direct impacts were expressed as the proportion of known key habitat and range impacted. Available data undoubtedly do not include the locations of all active leks, brood use areas and wintering grounds. This would probably cause both an underestimate of the number of key habitat areas affected and the total numbers of keyhabitat areas in the deployment area. However, the proportion of key habitats affected as conservatively estimated in this analysis would be assumed to remain the same.

Indirect impacts to sage grouse habitat were estimated by combining sage grouse distribution data with output from an indirect effects model (ETR-30) and knowledge of road access into each hydrologic subunit.

Table 1.3.1-6. Potential impact to bighorn sheep resulting from construction and operation of M-X operating base at Coyote Spring for the Proposed Action and Alternatives 1,2,4,6, and 8.

HYDROLOGIC SUBUNIT		ABUNDANCE INDEX[1]	INDIRECT EFFECT INDEX[1]	OVERALL IMPACT[1]
NO.	NAME			
	Subunits within OB Suitability Area			
210	Coyote Spring	3	3	3
219	Muddy River Springs	2	3	2
	Other Affected Subunits			
169B	Tikaboo	3	3	3
206	Kane Spring	2	3	2
216	Garnet	3	3	3
217	Hidden Valley	3	3	3
218	California Wash	2	3	2
	Overall Impact			3

4122

[1] 1 = No bighorn sheep present (abundance index), low indirect effect index (less than 1,000 in model described in ETR 30), low impact

2 = Less than 150 bighorn sheep present, moderate indirect effect index (1,000 to 10,000), moderate impact (moderate abundance and high or moderate effect index)

3 = More than 150 bighorn sheep present, high indirect effect index (over 10,000), high impact (high abundance and effect indexes)

PRINCIPAL IMPACTS TO KEY WILDLIFE SPECIES: EVALUATION OF PROJECT ALTERNATIVES

Pronghorn Antelope (1.3.2.1)

Pronghorn are a valuable wildlife resource because they are a prized game animal and have a high aesthetic value. For the 1978 hunting season, 5163 people applied for the 320 available tags in Utah while 2625 applied for the 391 available tags in Nevada (Jense and Burruss, 1979; Tsukamoto, 1979b). Their abundance and range were greatly reduced in the late 1800s and early 1900s, but present management is assisting population recovery in some areas of the Great Basin. Methods used for impact analysis have been described in the previous section.

Proposed Action - Pronghorn

Figure 1.3.2.1-1 shows the relationship between pronghorn range and conceptual project configuration. Since pronghorn do not range throughout the potential deployment area, direct project effects would be limited to the areas where overlap occurs, the greatest effect occurring where key habitat is disturbed. Key habitat is defined as areas where pronghorn are most frequently found, and includes water sources important for pronghorn survival, particularly during summer, and kidding areas. The conceptual project configuration for the proposed action would have construction activities dispersed throughout much of the key habitat in Lake, Railroad, Hot Creek and Hamlin valleys in Nevada and in Pine and Tule (White) valleys in western Utah. The project also intersects large portions of pronghorn range in Fish Creek, Wah Wah, Ralston, Patterson Wash, Lake, Railroad, Hot Creek, Little Smoky, Antelope, Stone Cabin, and Kobeh valleys. Thus, direct effects of project deployment would be expected in these areas.

The noise and visual effects of construction activities are expected to occur over an area considerably larger than that actually disturbed during construction of facilities. Pronghorn have an acute sense of sight and are not accustomed to seeing large construction projects in the Great Basin. The large and dispersed nature of the M-X project coincides with much of the known pronghorn range in the potential deployment area, often dissecting their habitat into small segments which would not provide refuge from visual contact with construction activities. Such division of habitat may also restrict access to localized high quality forage areas and water sources.

Water use for project construction will cause localized reductions in water table level in the vicinity of source wells. This could effect nearby spring-fed pronghorn water sources if the aquifer tapped is the same as that feeding the spring. Pronghorn are dependent upon key water sources within their range, especially during summer when vegetation moisture content is relatively low (Beale and Smith, 1970), and water table depression may seriously threaten some of these key water sources. Well locations have not been determined at this time, and consequently, potential for impact to specific pronghorn water sources cannot presently be determined.

Indirect effects resulting from recreational activities of construction workers and operations personnel would occur in areas where the project overlaps pronghorn

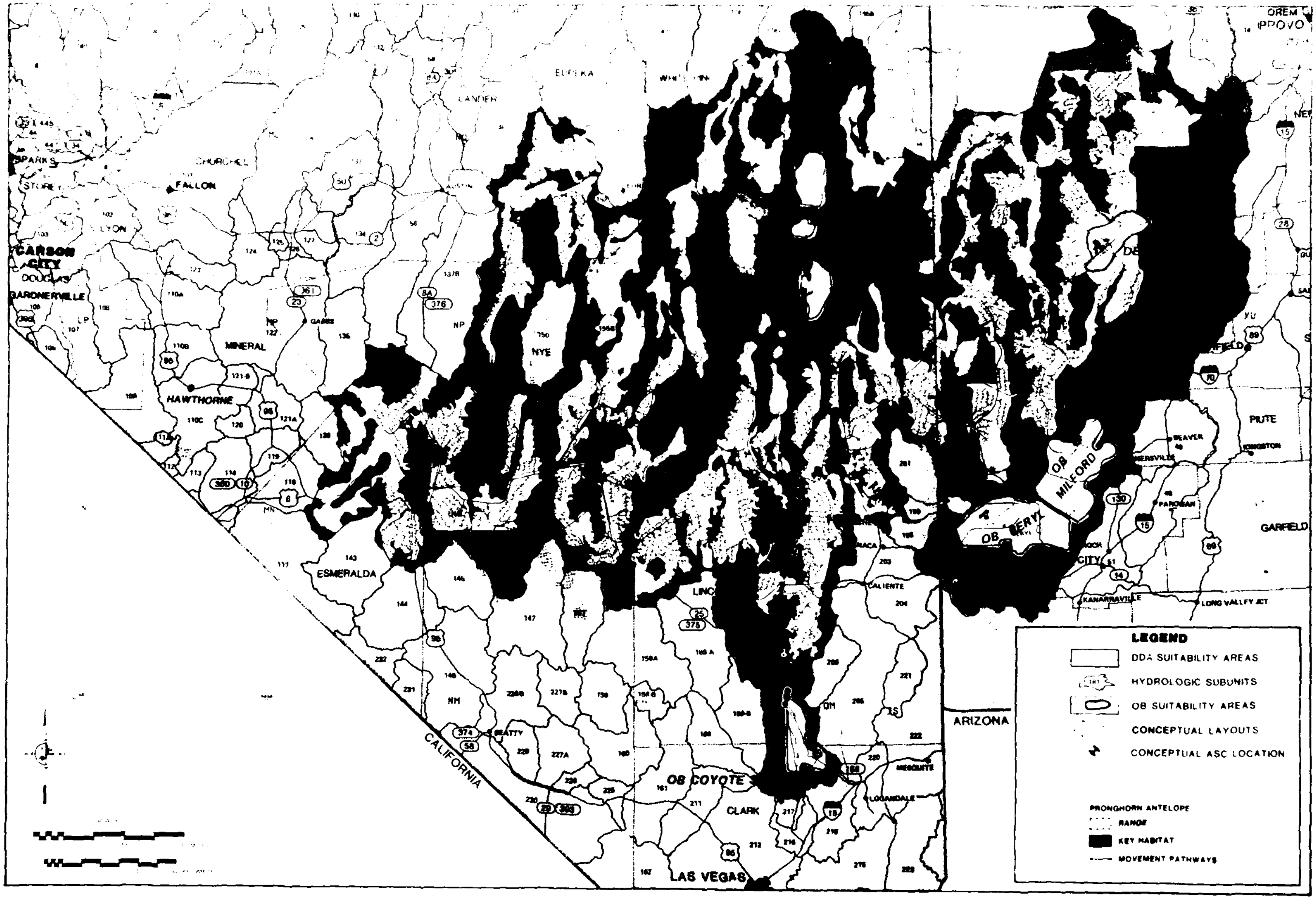

Figure 1.3.2.1-1. Pronghorn range and Proposed Action conceptual project layout

range as well as in the vicinity of construction camps or operating bases (OBs). Impacts of siting OBs in regions inhabited by pronghorn are associated primarily with increased human population. Water effects would be the same as described above for construction effects. In addition, an increase in human population would result in an increase in recreational use of nearby areas by hunters, fishermen, picnickers, and ORV enthusiasts. Pronghorn are nervous animals that are easily disturbed by human activity. Research has documented avoidance of vehicles, interruption of normal behavior patterns, and increased foraging effort associated with vehicular disturbance in Great Basin pronghorn (HDR draft technical report: Pronghorn, foraging economics, and group sizes: implications for conservation biology). Thus, ORV use and travel through key pronghorn habitat could be expected to significantly affect pronghorn populations. Increased human population would also increase illegal harvest of pronghorn in areas surrounding population centers. Illegal harvest is extremely difficult to measure, and may be as large or greater than the legal harvest (Pursley, 1977). For conservative estimates, present illegal harvest of pronghorn was assumed to be 75 percent of the legal harvest and to increase 50 percent with a 100 percent increase in human population (population increase figures from Section 2.3.3.3). For worst-case estimates, illegal harvest was assumed to be 150 percent of the legal harvest and to increase 100 percent with 100 percent increase in human population. These increases were assumed to affect pronghorn populations within 50 miles (80 km) of OB locations; therefore, calculations were based on 1978 legal harvest figures (Tsukamoto 1979b; Jense and Barruss, 1979) for pronghorn management units within 50 mi (80 km) of OB locations.

DDA Impacts

As noted above, the project could affect pronghorn through construction activities, water use, and recreation activities of construction personnel. Emplacement of facilities will result in habitat loss through removal of vegetation and pronghorn avoidance of construction activities. A further loss of habitat would occur if project activity restricts movement or access to water necessary for use of this habitat. Consumption of water during construction may cause a loss of surface water in springs. If this occurs, the carrying capacity of the existing pronghorn range may be reduced. Such effects, however, could be mitigated as discussed below. Increased human activity, including illegal harvest, harassment, and habitat degradation, will also affect pronghorn.

Implementation of other projects such as the Anaconda Moly project near Tonopah, White Pine Power Project (WPPP) in White Pine County, Pine Grove Moly project (Pine Valley), Allen Warner project in Dry Lake Valley, Alunite mine in Wah Wah Valley, and Intermountain Power Project (IPP) near Delta would compete for resources (e.g., water) and cause additional land disturbances and population growth; however, the effects of construction activities associated with these projects would be small compared to that for M-X, the exception being water use. The cumulative effects of water use, especially in areas where water availability is limited, could be measurable. For example, water use for the IPP could compound the effect of M-X water use in the Delta area. It is estimated that the IPP Lynndyl site would cause a 9 percent reduction of water flowing into areas surrounding Delta (IPP DEIS). Cumulative effects of water consumption on pronghorn in the vicinity of other projects will depend upon amount of water used, water availability, aquifer properties and timing of use by M-X and other projects. As for the combined indirect effects on pronghorn caused by human population growth, the incremental

increase resulting from construction and operation of the other projects will be small compared to that for M-X, except in the case of IPP near Delta where population increases will be similar to those proposed for M-X. (The IPP DEIS estimated a peak population increase of 5,000 people in 1987 and a long-term increase of 2,250 permanent residents resulting from the IPP Lynndyl site.)

M-X would have the greatest effect on pronghorn during the construction phase, since this is when intense activity would be widespread in their habitat. The effects of M-X construction will reduce pronghorn abundances in the short-term where project activity overlaps substantial portions of their range or any key habitat. The absolute level of this reduction cannot be reasonably estimated, but a worst case would be extirpation from some areas, possibly in Hamblin, Wah Wah, Kobeh, or Lake valleys. Long-term pronghorn abundance, however, is expected to be reduced very little since mitigation, management, and migration from contiguous undisturbed areas should bring pronghorn populations back to near pre-project levels. The reduction in long-term abundance, as compared to future predictions without M-X, will be related to amount and quality of habitat lost, and behavioral responses to the presence and operation of facilities.

The small amount of pronghorn habitat permanently lost represents an irreversible and irretrievable commitment of resources. On the other hand, loss of pronghorn due to this habitat loss could be recovered through mitigation measures (see below).

The consequences of the previously discussed effects on pronghorn will be to reduce their numbers. The greatest reduction will occur during construction in valleys where key habitat is lost, followed by recovery to new levels. This in turn will reduce recreational opportunities such as hunting, photography, and observation. Since pronghorn are a prized game animal with limited numbers in the potential deployment area, any measureable decrease in number is very likely to be perceived by many people as a significant impact, even if only short-term. Such perceived impacts are expected to occur primarily in those valleys where project activities are extensively dispersed through pronghorn range or in any key habitat.

The effects of construction activities are generally unavoidable because they result largely from pronghorn behavior, which cannot be easily modified. Pronghorn are known to habituate to some types of human disturbances, but this requires a longer period of time than is necessary for project construction and often requires intensive management. The effects of people and water use are largely avoidable and can be mitigated.

Predicted effect levels and their significance are summarized in Table 1.3.2.1-1 for each hydrologic subunit in which project elements would be deployed for the proposed action. Indirect effects could occur in subunits with no project elements as a result of recreation by construction workers, but these were assumed to be insignificant. From the table, it can be seen that signficant short-term impacts are likely to occur in 21 of the 41 subunits. Of the remaining 20 hydrologic subunits, 15 are not inhabited by pronghorn and no significant impacts are expected in the other 5. The presence of project elements within key habitat was the major reason for the determination of significant impact (in 18 of 21 hydrologic subunits). The short-term key habitat loss, including the 1 mi (1.6 km) avoidance factor, ranged from zero to 95 percent (Hot Creek Valley) with the majority exceeding

Table 1.3.2.1-1. Potential direct impact to pronghorn in Nevada/Utah DDA for the Proposed Action and Alternatives 1-6.

Hydrologic Subunit No.	Hydrologic Subunit Name	Abundance Index[1]	Short-Term Effects: % Habitat Loss[2] Range	Short-Term Effects: % Habitat Loss[2] Key	Short-Term Effects: Overall Impact[3]	Long-Term Effects: % Habitat Loss Range	Long-Term Effects: % Habitat Loss Key	Long-Term Effects: Overall Impact[4]
	Subunits with M-X Clusters and DTN							
4	Snake		35	45		1	1	
5	Pine		25	65		1	2	
6	White		20	90		0	2	
7	Fish Springs		85	15		1	1	
8	Dugway		10	55		0	1	
9	Government Creek		25	30		1	1	
46	Sevier Desert		16	50		1	2	
46A	Sevier Desert-Dry Lake[5]		35	25		1	1	
54	Wah Wah		95	50		2	1	
137A	Big Smoky-Tonopah Flat		0	0		0	0	
139	Kobeh		55	0		1	0	
140A	Monitor—Northern		0	0		0	0	
140B	Monitor—Southern		0	0		0	0	
141	Ralston		80	35		2	2	
142	Alkali Spring		0	0		0	0	
148	Cactus Flat		6	0		0	0	
149	Stone Cabin[5]		55	30		1	1	
151	Antelope		75	0		5	0	
154	Newark[5]		0	0		0	0	
155A	Little Smoky—Northern		0	0		0	0	
155C	Little Smoky—Southern		65	0		2	0	
156	Hot Creek		65	95		2	1	
170	Penoyer		0	0		0	0	
171	Coal		0	0		0	0	
172	Garden		0	0		0	0	
173A	Railroad—Southern		72	74		2	2	
173B	Railroad—Northern		45	63		1	1	
174	Jakes		0	0		0	0	
175	Long		0	0		0	0	
178B	Butte—South		0	0		0	0	
179	Steptoe		0	0		0	0	
180	Cave		0	0		0	0	
181	Dry Lake[5]		0	0		0	0	
182	Delamar		0	0		0	0	
183	Lake		85	85		1	1	
184	Spring		2	10		1	1	
196	Hamlin		40	80		1	2	
202	Patterson		80	45		1	1	
207	White River[5]		0	0		0	0	
208	Pahroc		0	0		0	0	
209	Pahranagat		0	0		0	0	
	Overall DDA Impact		40	45		1	1	

3826-3

1,3,4
No impact. (No range or key habitat present for Abundance Index.)
Moderate impact. (Range present for Abundance Index.)
High (significant) impact. (Key habitat present for Abundance Index.)

[2]Habitat loss during construction, including a 1 mile (1.6 km) avoidance effect zone around all construction activities.

[3]Loss of any key habitat or more than 50 percent of range in hydrologic subunit is considered significant. Loss of 26-50 percent range is considered moderate and loss of under 26 percent of range in a hydrologic subunit is considered insignificant.

[4]Any key habitat loss remaining after construction could cause a moderate impact.

[5]Conceptual location of Area Support Center (ASC).

40 percent. The loss of range, other than key habitat, exceeded 50 percent of that present in 11 hydrologic subunits. Kobeh, Antelope, and Little Smoky valleys were the only ones in which this occurred with no loss of key habitat. Long-term impacts to pronghorn are predicted to be much lower than those predicted for the short-term. The actual habitat disturbed during construction was calculated to be less than 5 percent of the available habitat in all hydrologic subunits (Table 1.3.2.1-1). Other factors, however, may act to increase the area of habitat loss through behavioral responses of pronghorn to the presence and operation of the various facilities. Loss of even a small amount of key habitat may impact pronghorn populations, particularly if the kidding areas are affected, but loss of small amounts of range are not expected to have any measureable long-term impact on pronghorn.

Several mitigation measures could be taken to reduce or compensate for the significant adverse impacts described above.

- Develop new water sources in areas outside of project influence which lack water but are otherwise suitable habitat.
- Limit ORV use in pronghorn habitat areas subject to Air Force and Bureau of Land Management jurisdiction.
- Prohibit possession of high power rifles by construction workers while stationed in construction camps (during both work and off-duty hours).
- Time construction activities within each hydrologic subunit where key habitat is present so that this habitat is not disturbed during the critical summer months.
- Initiate appropriate fencing and bypass procedures in migration and road traffic areas.
- Require strict enforcement of hunting laws, during construction, by state wildlife authorities.
- Encourage range improvement practices in areas outside of those developed for the project.

Operating Base (OB) Impacts

Figure 1.3.2.1-2 shows the relationship between pronghorn distribution and the operating base suitability area around Milford, Utah. Pronghorn do not inhabit the area near Coyote Spring Valley, Nevada.

Coyote Spring Valley, Nevada Area

Pronghorn do not inhabit the southern Nevada area near Coyote Spring Valley and, thus, will not be affected by location of an Operating Base in that vicinity.

Milford, Utah Area

The proposed operating base at Milford, Utah is located within pronghorn habitat in the Escalante Desert along the southern base of Topache Peak, the

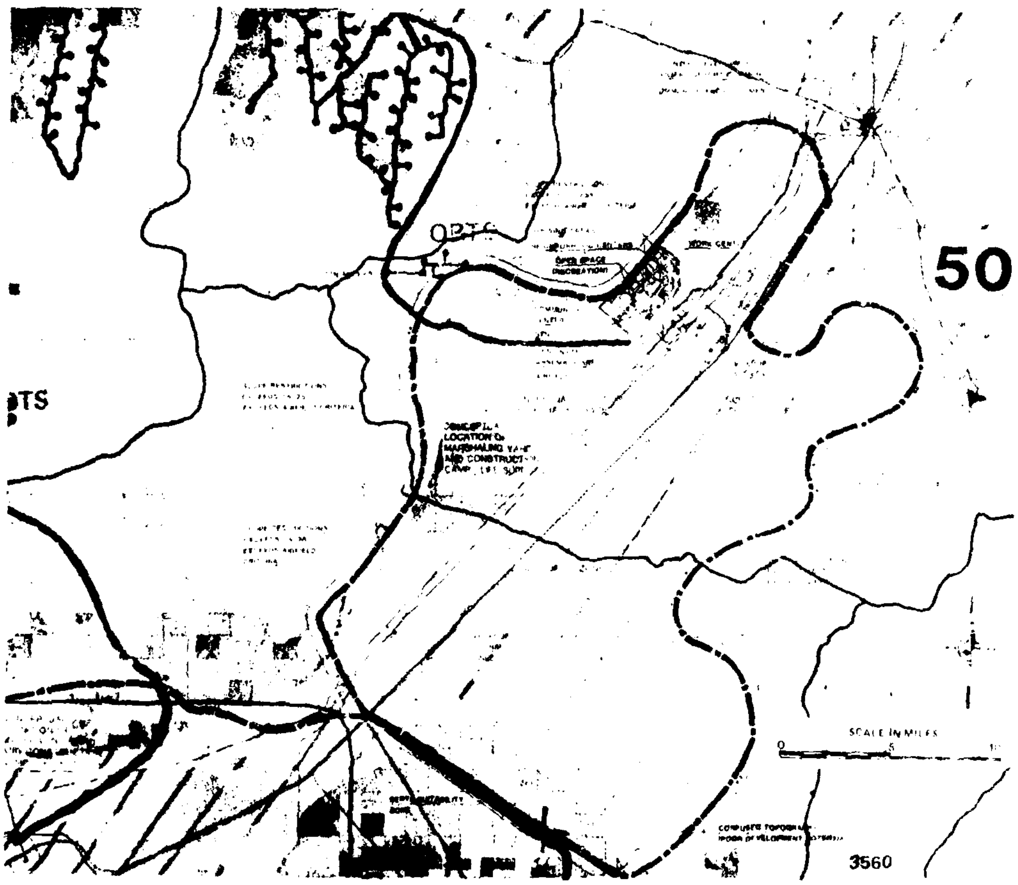

Figure 1.3.2.1-2. Pronghorn distribution in the vicinity of the Milford operating base.

Shauntie Hills and White Mountain. Construction of an OB at this site would eliminate 4,500 acres of pronghorn habitat, of which over half is key habitat. Additional key pronghorn habitat is located 7 miles (11 km) southwest of the OB along the eastern and southern slopes of the southeast end of the Wah Wah Mountains. OB construction and subsequent human activity in the OB vicinity would substantially affect pronghorn use of key habitats; extirpation of pronghorn in these areas is considered very likely. Water consumption may further impact these habitats by destroying key water sources as discussed previously. Locating the OB in other areas within the OB suitability area southeast of the Union Pacific railroad tracks and north of Lund, or due west of Thermo Siding and due north of Nada should reduce these effects.

An influx of an estimated 14,700 permanent residents to the Milford area would affect other pronghorn populations in Pine Valley, Hamlin Valley, Wah Wah Valley, Snake Valley, Tule Valley (White Valley hydrologic sub-unit), Parowan Valley, and the Sevier and Escalante Deserts (Milford, Cedar City, Lund and Beryl-Enterprise hydrologic subunits). Off-road vehicle use in the Escalante Desert is expected to be high, and would threaten the already low pronghorn population in the Milford area and in key habitat south of Lund. ORV use in Pine, Hamlin and Wah Wah Valleys would also increase to a much lesser extent.

The 1978 legal harvest in the two Utah herd units within 50 miles of Milford (See Appendix 1.6.3 for Utah game management area locations) was 34 pronghorn (Jense, 1979). A conservative estimate of illegal harvest resulting from the 237 percent population increase is 30 pronghorn; a worst case estimate is 120 animals. The combined effect of ORV use and illegal harvest would undoubedly impact populations in the Sevier Desert, Hamlin, Pine, and Wah Wah valleys, and may affect populations in Snake, Parowan and Tule valleys as well. Other (non-M-X) projects in the area are not expected to change these effects.

The impact of locating an OB near Milford would persist throughout the lifetime of the M-X system. Pronghorn populations in the region would not recover until M-X personnel leave the area because of the continued effect of the activities of 14,700 people. During the peak construction period, the impacts would be slightly greater because of higher population levels in the Milford area. The impact of this large human population growth would be largely unavoidable. Pronghorn abundance would decline in this area, with an associated decline in both consumptive (e.g., hunting) and nonconsumptive use (e.g., photography and animal observation) of the resource. Undoubtedly, some Milford residents would experience a reduction in their aesthetic enjoyment of the region because of decrease or extirpation of pronghorn populations; this would be perceived as significant to some proportion of the area's population.

Certain measures may effectively mitigate impacts to pronghorn in the Milford area. These include locating the OB so as to avoid key habitat within the OB suitability zone, and constructing artificial water sources in key areas if water table depression becomes a serious threat. Restricting ORV use in key habitats and increasing law enforcement activities in pronghorn range to reduce illegal harvest may also be helpful.

A summary of potential impact to pronghorn due to OB locations for the proposed action is presented in Table 1.3.2.1-2.

Table 1.3.2.1-2. Potential overall impact to pronghorn resulting from construction and operation of M-X operating bases for the Proposed Action and Alternatives 1-8 (page 1 of 2).

HYDROLOGIC SUBUNIT OR COUNTY NO.	NAME	ABUNDANCE[1] INDEX	ESTIMATED OVERALL IMPACT[1] PROPOSED ACTION COYOTE SPRING/ MILFORD	ALT. 1 COYOTE SPRING/ BERYL	ALT. 2 COYOTE SPRING/ DELTA	ALT. 3 BERYL ELY	ALT. 4 BERYL, COYOTE SPRING
	Subunits or Counties within OB Suitability Area						
46	Sevier Desert	High	No impact	No impact	High	No impact	No impact
46A	Sevier Desert-Dry Lake[2]	High	No impact	No impact	High	No impact	No impact
50	Milford	High	High	No impact	No impact	No impact	No impact
52	Lund District	High	High	High	No impact	High	High
53	Beryl-Enterprise	Moderate	No impact	Moderate	No impact	Moderate	Moderate
179	Steptoe	High	No impact	No impact	No impact	High	No impact
210	Coyote Springs	No impact	No impact	No impact	No impact	No impact	No impact
219	Muddy River Springs	No impact	No impact	No impact	No impact	No impact	No impact
	Curry, NM[3]	No impact	No impact	No impact	No impact	No impact	No impact
	Hartley, TX[3]	No impact	No impact	No impact	No impact	No impact	No impact
	Other Affected Subunits or Counties						
4	Snake	High	No impact	No impact	High	High	No impact
5	Pine	High	High	High	High	High	High
6	White	High	No impact	No impact	High	No impact	No impact
7	Fish Springs	High	No impact	No impact	High	No impact	No impact
8	Dugway	High	No impact	No impact	High	No impact	No impact
9	Government Creek	High	No impact	No impact	High	No impact	No impact
46A	Sevier Desert-Dry Lake[2]	High	High	No impact	No impact	No impact	No impact
49	Parowan	Moderate	Moderate	Moderate	No impact	Moderate	Moderate
50	Milford[2]	High	High	High	No impact	High	High
51	Cedar Spring	High	High	High	No impact	High	High
53	Beryl-Enterprise	Moderate	Moderate	No impact	No impact	No impact	No impact
54	Wah Wah	High	High	High	High	High	High
155	Little Smoky N & S	Moderate	No impact	No impact	No impact	Moderate	No impact
183	Lake	High	No impact	High	No impact	High	High
184	Spring	High	No impact	No impact	No impact	High	No impact
185	Tippet	High	No impact	No impact	No impact	High	No impact
196	Hamlin	High	High	High	No impact	High	High
202	Patterson	High	No impact	High	No impact	High	High
	Overall Alternative Impact		High	High	High	High	High

3827-2

[1] No impact. (No range or key habitat present for Abundance Index.)
Moderate impact. (Range present for Abundance Index.)
High (significant) impact. (Key habitat present for Abundance Index.)

[2]Conceptual location of Area Support Centers (ASCs) for the Proposed Action and Alternatives 1-6.

[3]Conceptual location of Area Support Centers (ASCs) for Alternative 7.

Table 1.3.2.1-2. Potential overall impact to pronghorn resulting from construction and operation of M-X operating bases for the Proposed Action and Alternatives 1-8 (page 2 of 2).

HYDROLOGIC SUBUNIT OR COUNTY NO.	HYDROLOGIC SUBUNIT OR COUNTY NAME	ABUNDANCE[1] INDEX	ESTIMATED OVERALL IMPACT[1] ALT. 5 MILFORD/ ELY	ALT. 6 MILFORD/ COYOTE SPRING	ALT. 7 CLOVIS/ DALHART	ALT. 8 COYOTE SPRING/ CLOVIS
	Subunits or Counties within OB Suitability Area					
46	Sevier Desert	High				
46A	Sevier Desert-Dry Lake[2]	High				
50	Milford[2]	High	High	High		
52	Lund District	High	High	High		
53	Beryl-Enterprise	Moderate				
179	Steptoe	High	High			
210	Coyote Springs					
219	Muddy River Springs					
	Curry, NM[3]					
	Hartley, TX[3]	Moderate				
	Other Affected Subunits or Counties					
4	Snake	High	High			
5	Pine	High	High			
6	White	High				
7	Fish Springs	High				
8	Dugway	High				
9	Government Creek	High				
46A	Sevier Desert-Dry Lake[2]	High	High	High		
49	Parowan	Moderate	Moderate	Moderate		
50	Milford[2]	High				
51	Cedar Spring	High	High	High		
53	Beryl-Enterprise	Moderate	Moderate	Moderate		
54	Wah Wah	High	High	High		
155	Little Smoky N & S	Moderate	Moderate			
183	Lake	High	High			
184	Spring	High	High			
185	Tippet	High	High			
196	Hamlin	High	High	High		
202	Patterson	High				
	Overall Alternative Impact		High	High		

3827-2

[1]
- No impact. (No range or key habitat present for Abundance Index.)
- Moderate impact. (Range present for Abundance Index.)
- High (significant) impact. (Key habitat present for Abundance Index.)

[2]Conceptual location of Area Support Centers (ASCs) for the Proposed Action and Alternatives 1-6.

[3]Conceptual location of Area Support Centers (ASCs) for Alternative 7.

Alternative 1

DDA Impacts

The DDA configuration for Alternative 1 is the same as that for the Proposed Action, and the DDA impacts are the same as those identified for the Proposed Action.

Operating Base (OB) Impacts

Figure 1.3.2.1-3 shows the relationship between pronghorn distribution and operating base suitability area around Beryl, Utah.

Coyote Spring Valley, Nevada Area

Pronghorn do not inhabit the region around Coyote Spring Valley and would not be affected by locating an OB in that area.

Beryl, Utah Area

The OB suitability envelope near Beryl, Utah occupies pronghorn range in the Escalante Desert. Approximately 100 mi^2 (260 km^2) of key habitat is located around Table Butte, 10 miles (16 km) east of Beryl. The removal of 3,000 to 6,000 acres (1,200 to 2,400 ha) of pronghorn range for construction of the OB should have no significant impact on pronghorn unless the OB is located in the Table Butte key habitat. Recreation use and illegal harvest by M-X personnel may significantly affect pronghorn populations in the region as discussed previously for the Proposed Action.

Pronghorn in Hamblin Valley, Pine Valley, Wah Wah Valley and the Escalante Desert (Milford, Cedar City, Lund and Beryl-Enterprise hydrologic subunits) would most likely suffer to some extent from an estimated permanent population increase of 14,500. Populations in Parowan, Patterson and Lake Valleys could potentially be affected, and the impact to the Table Butte animals is likely to be significant. Heavy use and no mitigation could eliminate pronghorn from Table Butte key habitat, but some effort to reduce ORV and illegal harvest effects could hold losses to a moderate reduction in population. Water consumption by 14,500 residents may threaten important pronghorn water sources near Table Butte. If water table depression is great enough to dry up key water sources, pronghorn would be displaced from the area. Proposed developments other than M-X in the Beryl vicinity are not expected to significantly affect pronghorn.

The impact of an OB site at Beryl would persist throughout the lifetime of the M-X project. No significant recovery of the pronghorn resource is expected until M-X personnel vacate Beryl. During the peak construction period, impacts would be slightly greater because of higher population levels in the Beryl area. Because pronghorn are a highly valued resource for both consumptive and non-consumptive use, the decline in Escalante Desert pronghorn would be perceived as a significant negative impact by many area residents, especially if the effects are unmitigated.

Some impact to the Table Butte pronghorn is unavoidable if an OB is situated at Beryl. However, the magnitude of the impact may be reduced through some

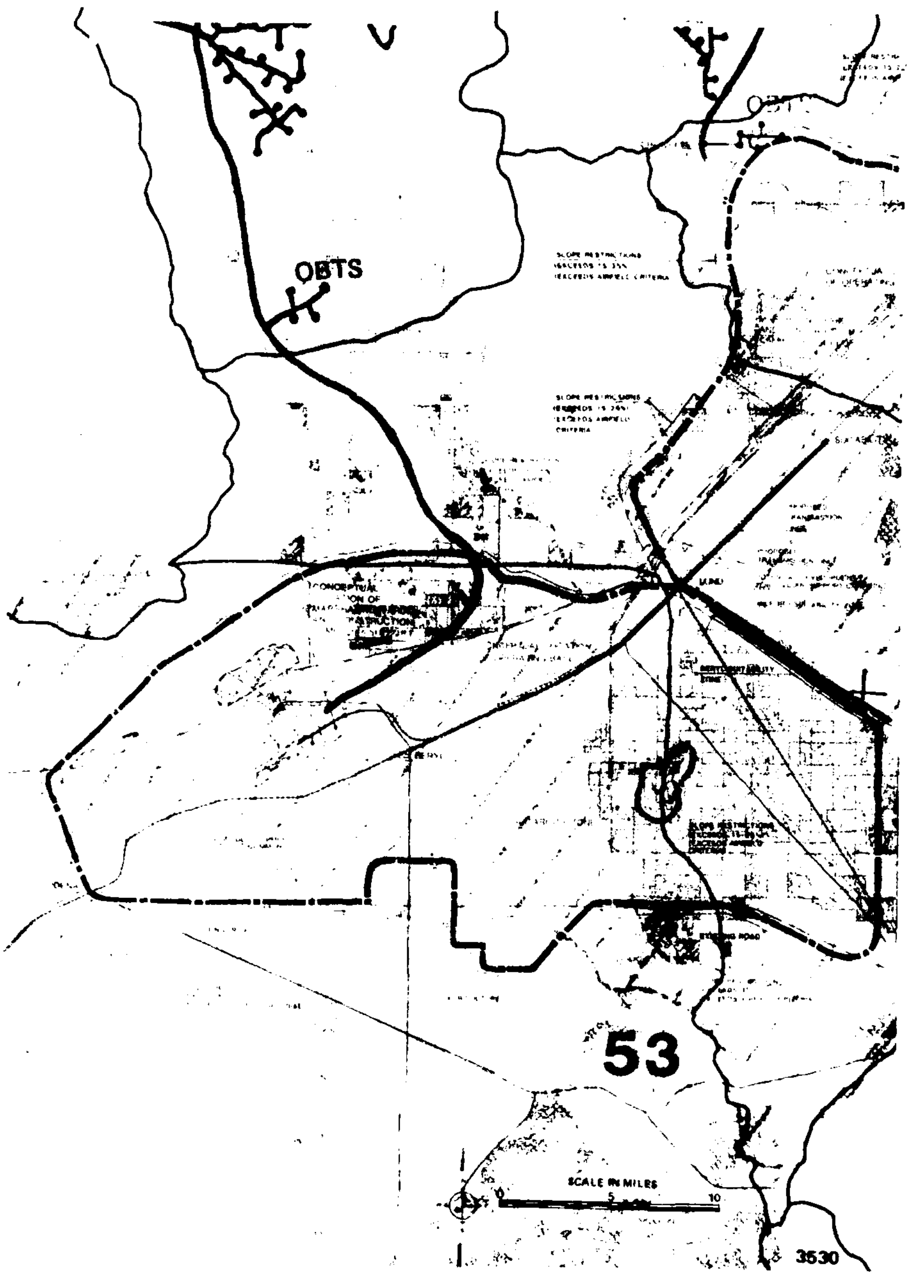

Figure 1.3.2.1-2. Pronghorn distri)ution in the vicinity (f the Beryl operating base.

mitigation measures such as restricting ORV use and building artificial water sources.

A summary of potential impact to pronghorn due to OB locations for Alternative 1 is presented in Table 1.3.2.1-2.

Alternative 2

DDA Impacts

DDA impacts are the same as those discussed in DDA impacts.

Operating Base (OB) Impacts

Figure 1.3.2.1-4 shows the relationship between pronghorn distribution and operating base suitability area for Delta, Utah. Pronghorn do not inhabit the area near Coyote Spring Valley, Nevada.

Coyote Spring Valley, Nevada Area

Pronghorn do not inhabit the region around Coyote Spring Valley and will not be affected by locating an OB in that area.

Delta, Utah Area

The proposed OB at Delta, Utah is situated on the edge of pronghorn range in the Sevier Desert. The removal of 4,200-4,500 (1,700 to 1,800 ha) acres of pronghorn range to construct the OB should have no significant effect on pronghorn populations. The most serious threat to Sevier Desert pronghorn posed by a Delta OB is harassment by recreationists and illegal harvest, especially in the Desert Mountain area 25 miles (40 km) north of Delta. Harassment by ORV users could potentially decrease use of this key habitat by pronghorn, but the presence of a great deal of suitable ORV use area closer to Delta should render these effects insignificant. The 1978 legal harvest in the three management areas within 50 miles of Delta (see Appendix 4 for Utah game management area locations) was 53 pronghorn (Jense, 1979). A conservative estimate of illegal harvest resulting from the 110 percent population increase is 22 pronghorn; a worst-case estimate is 87 animals. This may affect important pronghorn populations in the Sevier Desert, Tule Valley (White Valley hydroligic subunit), Wah Wah Valley, Pine Valley, and Snake Valley. Pronghorn in Fish Springs, Dugway and Government Valleys may also suffer, but losses are not expected to be significant. Any impacts due to OB siting in Delta would persist for the duration of the M-X project. During the peak construction period, impacts would be slightly greater because of higher population levels in the Delta area. Mitigation possibilities include restricting ORV use and increased patrolling of pronghorn key habitat as discussed for the Proposed Action. A summary of potential impact to pronghorn due to OB locations for Alternative 2 is presented in Table 1.3.2.1-2.

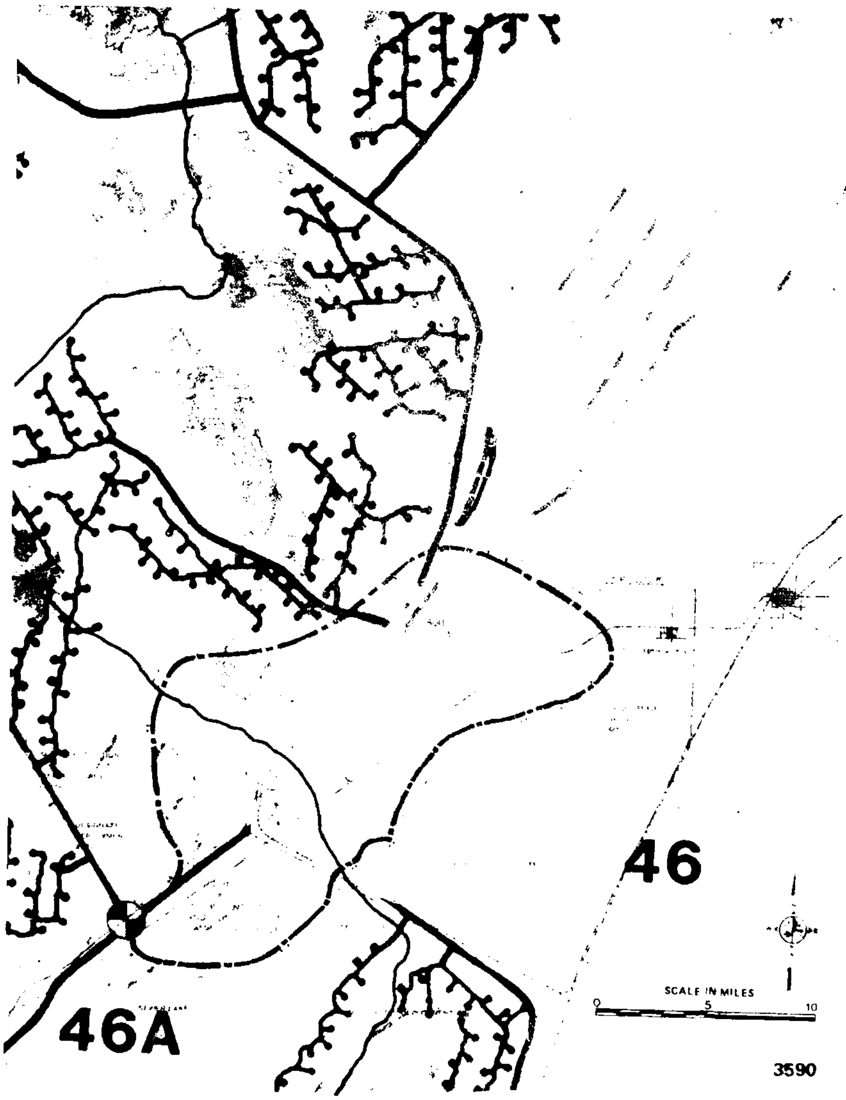

Figure 1.3.2.1-4. Pronghorn distribution in the vicinity of the Delta operating base.

Alternative 3

DDA Impacts

In Alternative 3, the DDA remains the same as for the Proposed Action with the same potential impacts.

Operating Base (OB) Impacts

Figures 1.3.2.1-3 and 1.3.2.1-5 show the distribution of pronghorn in relationship to operating base suitability areas for Beryl and Ely.

Beryl, Utah Area

Impacts of an OB located near Beryl, Utah are discussed for Alternative 1. Having Beryl as a primary base would remove an estimated 5,000-5,500 acres (2,000 to 2,200 ha) of pronghorn habitat in the Beryl area and would add approximately 19,680 permanent residents. These figures differ from those in Alternative 1 but do not substantially change the effects of OB location at Beryl.

Ely, Nevada Area

The proposed OB location near Ely, Nevada would not directly remove any key pronghorn habitat unless located in the extreme northern end of the suitability zone near Warm Springs. If located north of Warm Springs, OB construction would eliminate 4,500 acres (1,800 ha) of pronghorn habitat and up to 600 acres (240 ha) of key habitat. This may not significantly impact pronghorn populations, but construction and subsequent human activity in these areas pose a major threat to Steptoe Valley pronghorn. Additional impacts of an OB in Ely would stem from the indirect effects of the movements and recreational activities of an estimated 14,500 additional permanent residents in the Ely region. Spring Valley, northern Steptoe Valley, Snake Valley and Tippett Valley support some of the largest pronghorn populations in the potential M-X deployment area and include large areas of key habitat. Increased recreation pressure from fishermen, hunters, campers and ORV enthusiasts in the key habitat areas would affect pronghorn to some extent. The effects of increased vehicular travel through key habitats to favored fishing, hunting and camping spots in the Schell Creek Range could greatly impact pronghorn populations if not properly controlled. Pronghorn in Lake Valley may also be affected. The 1978 legal harvest in the four management areas within 50 miles of Ely (see Appendix 1.6.3 for Nevada game management area locations) was 37 pronghorn (Tsukamoto 1979). Illegal harvest of pronghorn in Spring and Steptoe valleys would increase by an estimated 19 to 78 animals as a result of an estimated 140 percent human population increase. Some impact to pronghorn resources is inevitable, but the magnitude and significance of the impact is speculative. It is reasonable to expect a reversal in the present increasing population trend, but the extent of this may not be highly significant. Because these effects are due to increased human population levels associated with an Ely OB, they would persist throughout the lifetime of the M-X project. During the peak construction period impacts would be slightly greater because of higher population levels in the Ely area. Measures that may mitigate the impact of an Ely OB include restricting vehicular access to key pronghorn habitats and increased patrolling to reduce illegal harvest.

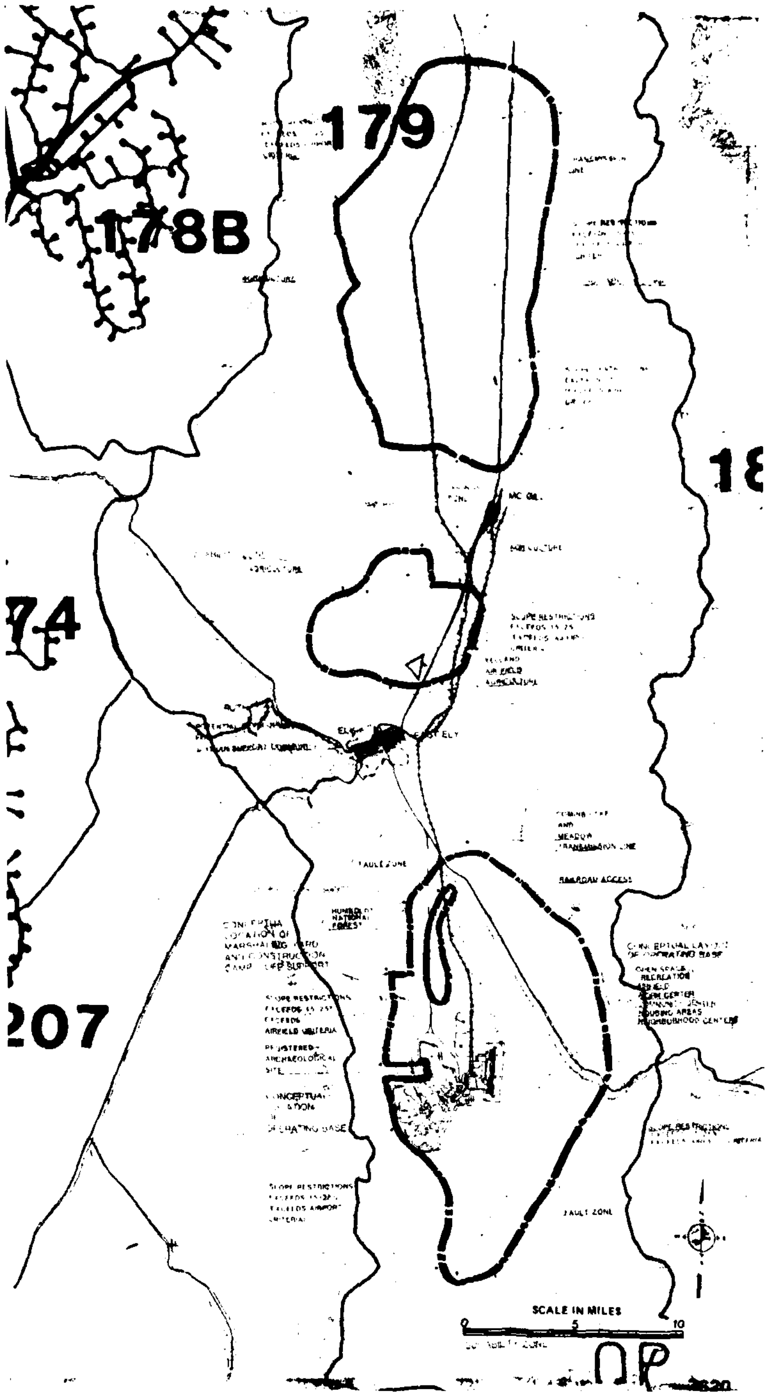

Figure 1.3.2.1-5. Pronghorn distribution in the vicinity of the Ely operating base.

A summary of potential impact to pronghorn due to OB locations for Alternative 3 is presented in Table 1.3.2.1-2.

Alternative 4

DDA Impacts

The DDA in Alternative 4 is the same as that for the Proposed Action, so the potential impacts would be identical to those described for it.

Operating Base (OB) Locations

Figure 1.3.2.1-3 shows the distribution of pronghorn in relationship to operating base suitability area for Beryl.

Beryl, Utah

Impacts for proposed OB location at Beryl are discussed under Alternative 1.

Coyote Spring Valley, Nevada Area

Pronghorn do not inhabit the region around Coyote Spring Valley and will not be affected by locating an OB in that area.

A summary of potential impact to pronghorn due to OB locations for Alternative 4 are presented in Table 1.3.2.1-2.

Alternative 5

DDA Impacts

Impacts for Alternative 5 are the same as for the Proposed Action.

Operating Base (OB) Impacts

Figures 1.3.2.1-2 and 1.3.2.1-5 show the distribution of pronghorn relative to the operating base suitability areas at Milford and Ely.

Milford, Utah Area

Impacts for a proposed OB location at Milford are discussed for the Proposed Action. Having Milford as the primary base will remove an estimated 5,000-5,500 acres (2,000 to 2,200 ha) of pronghorn habitat in the Milford area and add approximately 19,550 permanent residents. These figures differ from those in the proposed action but do not substantially change the effects of OB location at Milford.

Ely, Nevada Area

Impacts for the proposed OB location at Ely are discussed under Alternative 3.

A summary of potential impacts to pronghorn due to OB locations for Alternative 5 is presented in Table 1.3.2.1-2.

Alternative 6

DDA Impacts

For Alternative 6, the DDA and potential impacts would be the same as for the Proposed Action.

Operating Base (OB) Impacts

Figure 1.3.2.1-2 shows the distribution of pronghorn relative to the operating base suitability areas at Milford. There is no pronghorn range in the vicinity of the Coyote Spring Valley operating base suitability area.

Milford, Utah Area

Impacts for the propsed OB location at Milford are discussed for the Proposed Action.

Coyote Spring Valley, Nevada Area

Pronghorn do not inhabit the region around Coyote Spring Valley and will not be affected by locating an OB in that area.

A summary of potential impacts to pronghorn due to OB locations for Alternative 6 is presented in Table 1.3.2.1-2.

Alternative 7 (Full Deployment, Texas/New Mexico)

Figure 1.3.2.1-6 shows the relationship between pronghorn distribution and configuration of this alternative. Direct project effects would be limited to areas of overlap in rangeland in 4 counties in Texas and 7 counties in New Mexico. Key habitat data comparable to those from Nevada and Utah were not available for the Texas/New Mexico High Plains. Indirect effects resulting from increased use by construction workers would occur in areas where the project overlaps pronghorn range as well as in areas near construction camps which contain no project features. The two operating bases at Clovis and Dalhart are not in pronghorn range. There are no other large-scale projects which might compete with M-X planned in the region, although there are CO_2 pipelines planned in New Mexico.

DDA Impacts

As noted above, the project could affect pronghorn through construction activities and recreation activities of construction personnel. Water use is not an issue here, as surface water featues are not linked with the water source for the project, the Ogallala aquifier. Emplacement of facilities would result in short-term habitat loss through removal of vegetation and pronghorn avoidance of construction activities. This avoidance could result in a further loss of habitat if it restricts movement over and above the restrictions already imposed by fencing of range and farmland. Long-term effects would be related to permanent habitat loss. Increased

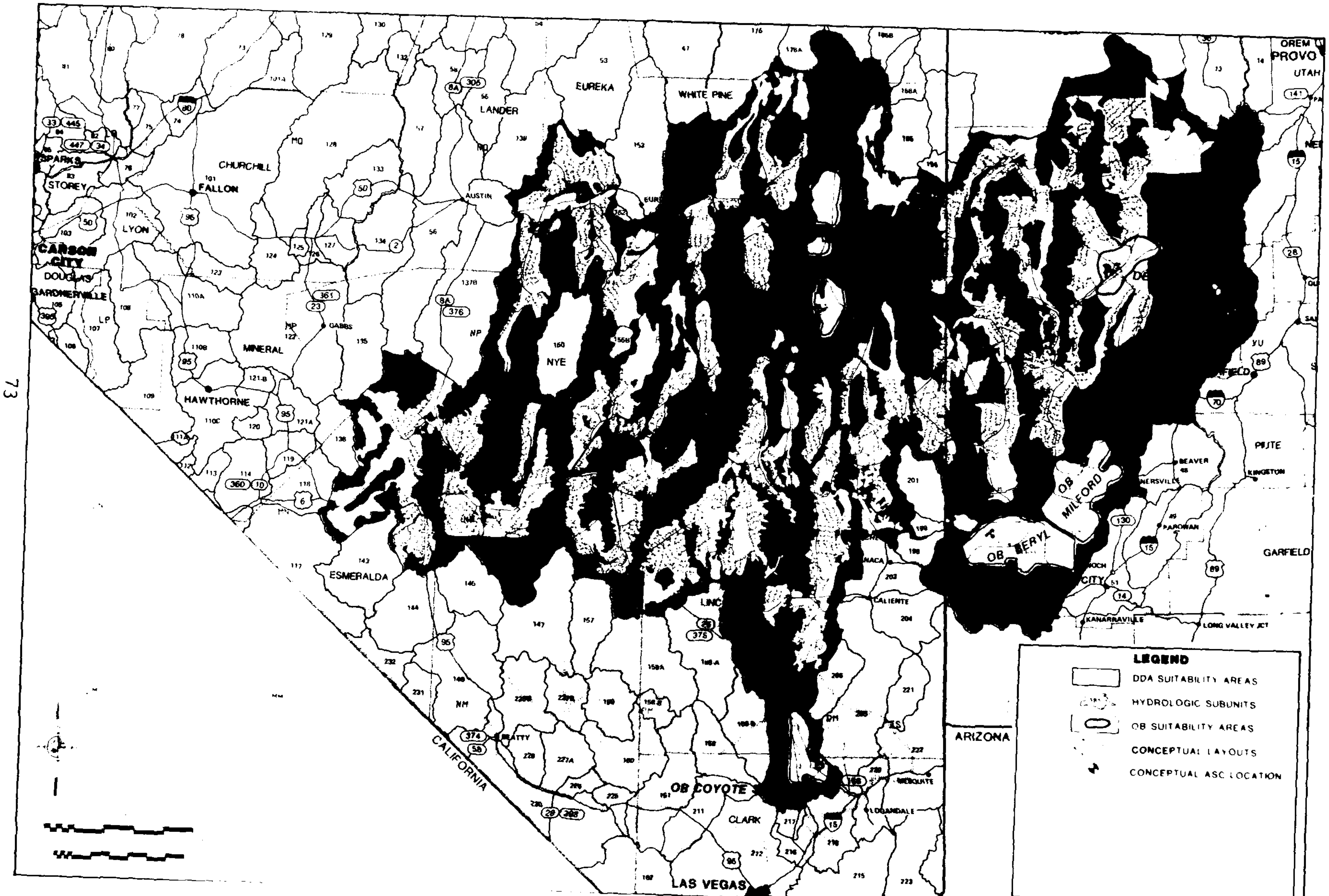

Figure 1.3.2.1-6. Intersection of pronghorn range and the conceptual project layout for Alternative 7.

human activity, primarily recreation, would affect pronghorn through illegal harvest, harassment, and habitat degradation. However, as much of the pronghorn range is privately held, these effects would be minimized through owner intervention. In Texas, pronghorn herds are managed for hunting, for which the individual landowner receives a fee from each hunter.

M-X would have the greatest effect on pronghorn during the construction phase since this is when intense activity will be widespread in their habitat. Mortality resulting from habitat loss and poaching may decrease herd size during this time (assuming all displaced animals die). After construction is completed, pronghorn are likely to repopulate suitable habitat remaining, either from contiguous undisturbed areas or through transplants by wildlife departments. Population levels are expected to stabilize at new levels. Whether these levels are the same as for pre-M-X populations will depend upon the amount of habitat permanently lost, the rate of recovery (revegetation) of temporarily disturbed areas, and behavioral responses to the presence and operation of the facilities. Habitat quality in Texas/New Mexico is superior to that in Nevada/Utah, AUM values being fives times as high in the first as in the second. Additionally, as food overlap between cattle and pronghorn in Texas/New Mexico is roughly 19 percent, overgrazed rangeland is often good habitat for pronghorn (Buechner, 1950). Due to the higher level of human disturbance already present in Texas and New Mexico, pronghorn tolerance to human activity is likely to be greater than in Nevada/Utah, reducing the effect, perhaps to the level where it could be considered not significant terms of herd size and productivity. See Table 1.3.2.1-3 for impact summary.

The effects of construction would reduce short-term productivity by removal of forage areas, but local extirpation is unlikely. Long-term productivity, however, is expected to be reduced very little since game management should bring abundances back to near pre-project levels. The reduction in long-term productivity, as compared to future predictions without M-X, would be related to amount of habitat lost. Due to the income derived from hunters, there would be considerable effort by landowners to restore abundances.

The small amount of pronghorn habitat permanently lost, roughly 1.1 percent of the total, represents an irreversible and irretrievable commitment of resources. Loss of animals, on the other hand, could be reduced through mitigation measures (see below).

The consequences of the previously discussed effects on pronghorn would be to reduce their abundance. The greatest reduction would be during construction. This in turn would reduce recreational opportunities such as hunting and nonconsumptive uses (e.g., photography and observation) in a similar manner. Since pronghorn are a game animal and source of income in the potential deployment area, any measureable decrease in abundance is very likely to be perceived by many people as a significant impact, even if it is of short duration.

The effects of construction activities are generally unavoidable because they result largely from pronghorn behavior, which cannot be easily modified. Pronghorn have habituated to some types of human disturbances, but the increase due to project construction may exceed the existing tolerances. The effects of people are largely avoidable or could be mitigated by the actions described below.

Table 1.3.2.1-3. Potential impact to pronghorn resulting from construction and operation of M-X operating bases for Alternative 7.

COUNTY	ABUNDANCE INDEX[1]	SHORT-TERM % RANGE LOSS	SHORT-TERM ESTIMATED OVERALL IMPACT[3]	LONG-TERM % RANGE LOSS	LONG-TERM ESTIMATED OVERALL IMPACT
Counties with M-X Clusters and DTN					
Bailey, TX		0		0	
Castro, TX		0		0	
Cochran, TX		6		1	
Dallam, TX		25		3	
Deaf Smith, TX[2]		20		6	
Hartley, TX[2]		15		2	
Hockley, TX		0		0	
Lamb, TX		0		0	
Oldham, TX		4		1	
Parmer, TX		0		0	
Randall, TX		0		0	
Sherman, TX		0		0	
Swisher, TX		0		0	
Chaves, NM		7		1	
Curry, NM[2]		20		7	
DeBaca, NM		4		1	
Guadalupe, NM		0		0	
Harding, NM		15		1	
Lea, NM		0		0	
Quay, NM		9		1	
Roosevelt, NM[2]		25		2	
Union, NM		9		1	
Overall Alternative Impact		10		1	

3829-2

[1, 3] No impact. (No range or key habitat present for Abundance Index.)

Moderate impact. (Range present for Abundance Index.)

High (significant) impact. (Key habitat present for Abundance Index.)

[2] Conceptual location of Area Support Center (ASC).

[3] Loss of any key habitat or more than 50 percent of range in county is considered significant (High impact). Loss of 26-50 percent range in a county is considered moderate, and loss of 25 percent or less of range in a county is considered insignificant (No impact).

Predicted impacts and their significance are summarized in Table 1.3.2.1-3 for each county in which project elements would be deployed for this option. This shows that impacts are likely to occur in 12 of the 19 counties, but they are not likely to be significant.

Several mitigation measures could be taken to reduce or compensate for the adverse impacts described above.

- Prohibit possession of firearms by construction workers while stationed in construction camps (during both work and off-duty hours).
- Limit ORV use in pronghorn habitat areas subject to Air Force or BLM jurisdiction.

Operating Base Impacts

Clovis, New Mexico Area

The Clovis operating base is not in pronghorn range.

Dalhart, Texas

The Dalhart OB (Figure 1.3.2.1-7) is in pronghorn range, and near the Canadian Breaks, where significant pronghorn populations occur in the extensive rangeland. However, the land dedicated to the OB is farmland, and no pronghorn are present in the immediate vicinity, so no significant direct effects are expected. Similarly, as the surrounding lands are privately held and hunting is strictly regulated, no significant indirect effects are expected (Table 1.3.2.1-2).

Alternative 8

Alternative 8 and pronghorn distribution are shown in Figures 1.3.2.1-8 and -9. Only one OB would be necessary in each basing area for this alternative, at Coyote Spring and Clovis. Deploying half the project in Nevada and Utah would reduce the number of hydrologic subunits containing project elements approximately 40 percent. The areas of highest pronghorn abundance (Snake, Pine, Spring, and Hamlin valleys) are still within the project area, while 8 of the 24 hydrologic units used in split basing are not inhabited by pronghorn. The direct and indirect effects of project deployment would be the same as described above for the proposed action.

In Texas and New Mexico, the overall project area is also reduced by about half, but the split-basing deployment concentrates clusters in rangeland. Thus, 79 of the 100 clusters are placed in pronghorn range in Dallam, Hartley, Oldham, Deaf Smith, and Cochran Counties, Texas, and Union, Harding, Quay, Roosevelt, Curry and Chaves counties, New Mexico, the same counties involved in full basing.

DDA Impacts

Deployment of the DDA necessary for basing half the project in Nevada and Utah and half in Texas and New Mexico could affect pronghorn through construction activities, water use (Nevada/Utah only) and recreation activities of construction

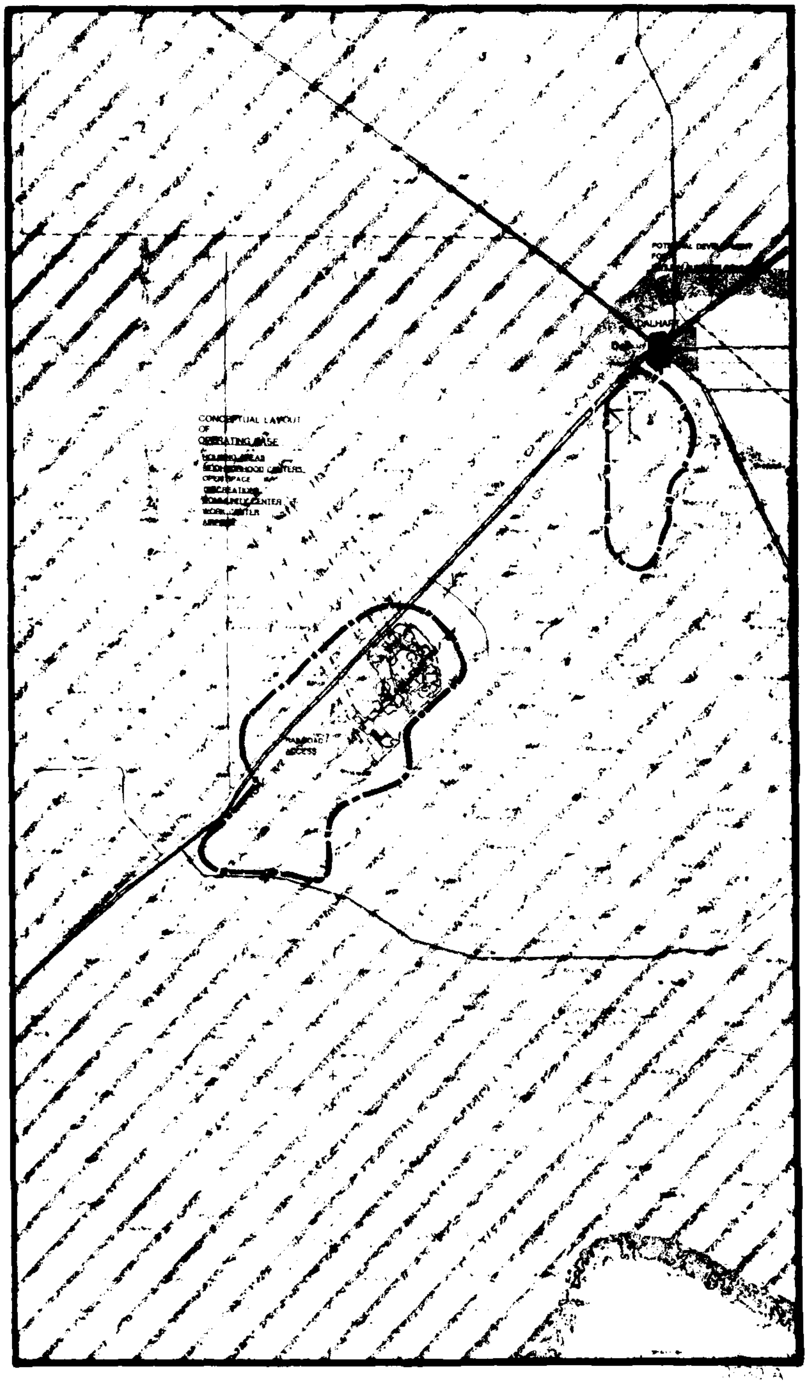

Figure 1.3.2.1-7. Pronghorn antelope in the vicinity of the Dalhart operating base.

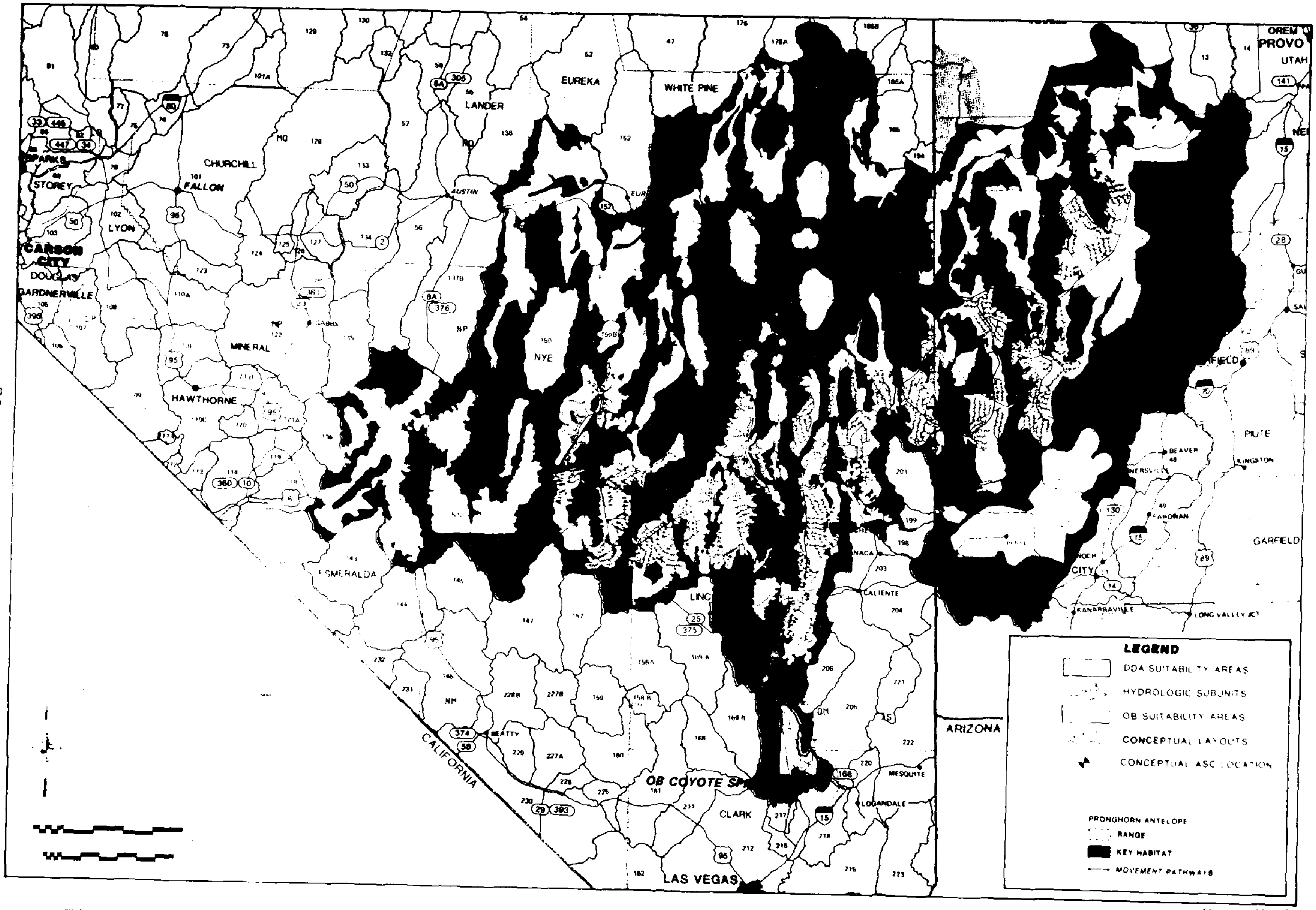

Figure 1.3.2.1-8. Pronghorn range and Alternative 8 layout (Nevada/Utah portion).

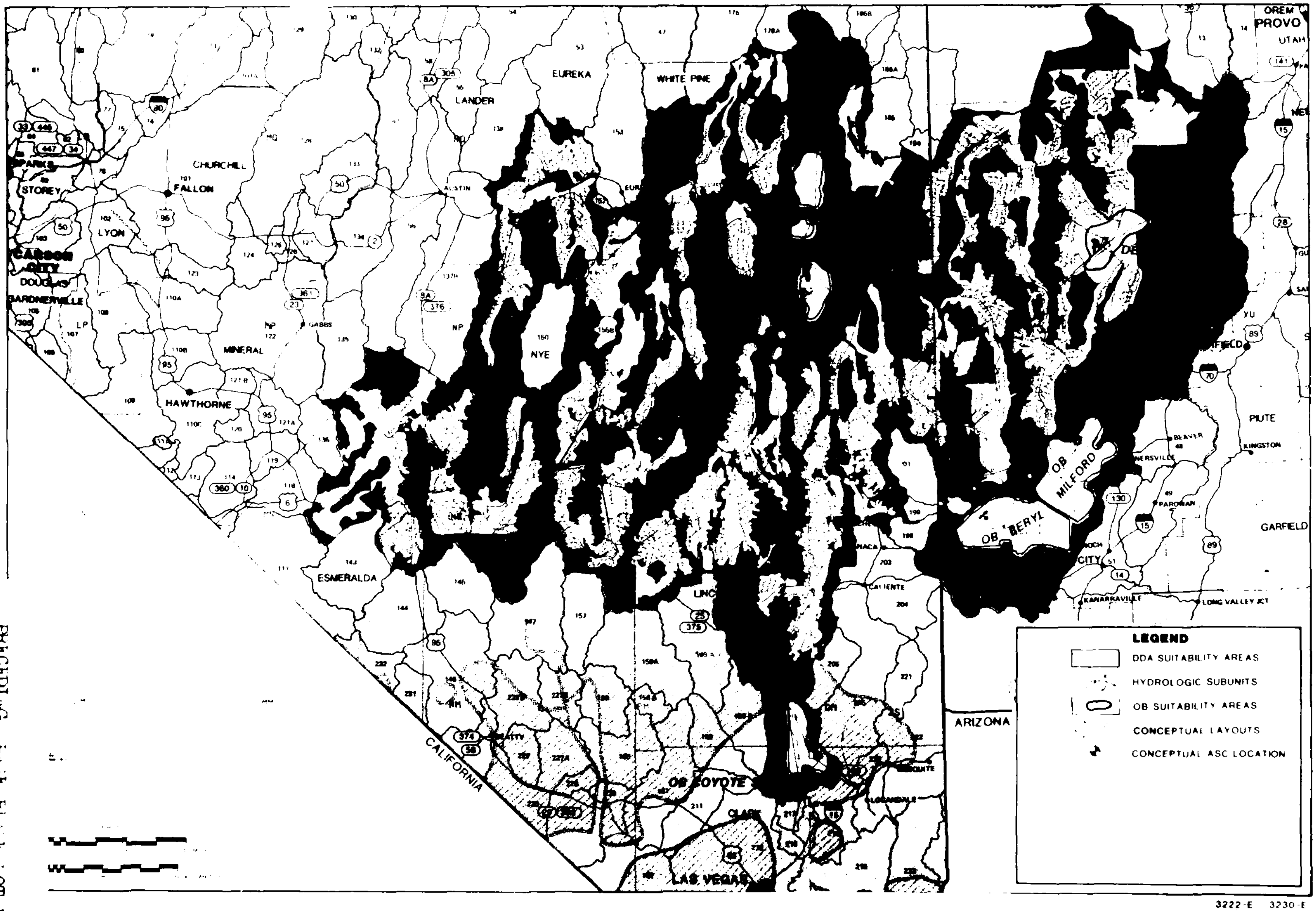

Figure 1.3.2.1-9. Pronghorn range and Alternative 8 conceptual layout (Texas/New Mexico portion).

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workers as discussed for the proposed action and Alternative 7. The potential for combined effects of M-X and other projects planned for the Nevada/Utah study area would be reduced since the Anaconda Moly project and all but the northern White River Valley potential site for WPPP would be outside the deployment area. Interactions with Alunite, Pine Grove Moly, IPP and Allen Warner could still occur. No other significant projects are planned for the Texas and New Mexico area.

Time-dependent effects of project implementation on pronghorn would be the same as described for the Proposed Action and Alternative 7.

The effects of M-X construction on short-term productivity of pronghorn will be similar to that described under the Proposed Action and Alternative 7. In Nevada and Utah, the reduction in productivity, however, will occur in fewer valleys. Areas that would likely have measureable reductions in short-term productivity for full basing but not for split basing, include Antelope, Stone Cabin, Kobeh, Fish Springs, and Dugway valleys (hydrologic subunits). In Texas and New Mexico, due to the concentration of clusters in pronghorn range, the effects would be similar to those discussed in Alternative 7 in both quality and quantity in all but Cochran and Dallam counties, where there would be less population reduction.

The small amount of pronghorn habitat permanently lost represents an irreversible and irretrievable commitment of resources. Loss of animals on the other hand could be replaced through mitigation measures.

The consequences of project-related effects on pronghorn are the same as those described for the Proposed Action and Alternative 7.

Predicted impacts and their significance are summarized in Table 1.3.2.1-4 for each hydrologic subunit or county in which project elements would be deployed for split basing. In Nevada/Utah, significant impacts are predicted for 14 of the 24 hydrologic subunits containing project elements. Eight of the ten remaining hydrologic subunits are not inhabited by pronghorn, and no significant impacts are expected in Penoyer and Little Smoky valley (#170 and #155C). Loss of key habitat was the reason for significant impact in all subunits. Long-term effects are the same as discussed for full basing. In Texas/New Mexico, all the counties affected by full basing would be affected in split basing, with indirect effects reduced in Cochran and Dallam counties, Texas, only. Otherwise, both indirect and direct effects would be as described in Alternative 7.

Mitigation measures that would reduce or compensate for the significant adverse impacts are the same as those listed for the Proposed Action and Alternative 7.

OB Impacts

Potential impacts to pronghorn in the vicinity of the Coyote Spring and Clovis OB sites would be the same as discussed for the Proposed Action and Alternative 7. These are summarized in Table 1.3.2.1-2.

Bighorn Sheep (1.3.2.2)

Bighorn sheep are a trophy big game species in Nevada and Utah for which hunter demand far exceeds the supply (1,289 applicant

Table 1.3.2.1-4. Potential impact to pronghorn in Nevada/Utah and Texas/New Mexico DDAs for Alternative 8.

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE INDEX[1]	SHORT-TERM EFFECTS			LONG-TERM EFFECTS		
			% HABITAT LOSS[2]		ESTIMATED OVERALL IMPACT[1]	% HABITAT LOSS		ESTIMATED OVERALL IMPACT[1]
NO.	NAME		RANGE	KEY		RANGE	KEY	
	Subunits or Counties with M-X Clusters and DTN							
4	Snake[3]	High	10	15	High	[illegible]	1	Moderate
[illegible]	Pine	High	25	65	High	1	2	Moderate
6	White	High	0	10	High	0	1	Moderate
7	Fish Springs	High	0	4	High	0	1	Moderate
46	Sevier Desert	High	7	20	High	1	[illegible]	Moderate
46A	Sevier Desert - Dry Lake[4]	High	25	25	High	1	1	Moderate
54	Wah Wah	High	95	50	High	2	1	Moderate
155C	Little Smoky—Southern	Moderate	4	0		1	0	
156	Hot Creek	High	60	95	High	2	1	Moderate
170	Penoyer	Moderate	0	0	No impact	0	0	
171	Coal	No impact	0	0	No impact	0	0	No impact
172	Garden	No impact	0	0	No impact	0	0	No impact
173A	Railroad—Southern	High	60	55	High	1	1	Moderate
173B	Railroad—Northern	High	10	25	High	1	1	Moderate
180	Cave	No impact	0	0	No impact	0	0	No impact
181	Dry Lake[2]	No impact	0	0	No impact	0	0	No impact
182	Delamar	No impact	0	0	No impact	0	0	No impact
183	Lake	High	60	85	High	1	1	Moderate
184	Spring	High	2	10	High	1	1	Moderate
196	Hamlin	High	40	80	High	1	2	Moderate
202	Patterson	High	80	45	High	1	1	Moderate
207	White River	No impact	0	0	No impact	0	0	No impact
208	Panroc	No impact	0	0	No impact	0	0	No impact
209	Pahranagat		0	0	No impact	0	0	No impact
	Bailey, TX	No impact	0	0	No impact	0	0	No impact
	Cochran, TX	Moderate	4	0	No impact	1	0	No impact
	Dallam, TX	Moderate	20	0	No impact	2	0	No impact
	Deaf Smith, TX	Moderate	20	0	No impact	6	0	No impact
	Hartley, TX[2]	Moderate	15	0	No impact	2	0	No impact
	Hockley, TX	No impact	0	0	No impact	0	0	No impact
	Lamb, TX	No impact	0	0	No impact	0	0	No impact
	Oldham, TX	Moderate	4	0	No impact	1	0	No impact
	Parmer, TX	No impact	0	0	No impact	0	0	No impact
	Chaves, NM	Moderate	7	0	No impact	1	0	No impact
	Curry, NM	Moderate	20	0	No impact	7	0	No impact
	DeBaca, NM	Moderate	3	0	No impact	1	0	No impact
	Guadalupe, NM	No impact	0	0	No impact	0	0	No impact
	Harding, NM	Moderate	15	0	No impact	1	0	No impact
	Lea, NM	No impact	0	0	No impact	0	0	No impact
	Quay, NM	Moderate	9	0	No impact	1	0	No impact
	Roosevelt, NM[4]	Moderate	25	0	No impact	2	0	No impact
	Union, NM	Moderate	9	0	No impact	1	0	No impact
	Overall Nevada/Utah		15	21	High	1	1	Moderate
	Overall Texas/New Mexico		10	0	No impact	1	0	No impact
	Overall Alternative 8				High			Moderate

3828-1

No impact. (No range or key habitat present for Abundance Index.)

Moderate impact. (Range present for Abundance Index.)

High (significant) impact. (Key habitat present for Abundance Index.)

[1]Conceptual location of Area Support Center (ASC).

[2]Loss of any key habitat or more than 50 percent of range in hydrologic subunit or county is considered significant. Loss of 26-50 percent range is considered moderate and loss of under 26 percent of range in a hydrologic subunit or county is considered insignificant. Any key habitat loss remaining after construction could cause a moderate impact.

[3]Habitat loss during construction. This includes a 1 mile (1.6 km) avoidance zone around all construction activities.

They also have a high aesthetic appeal. Bighorns once inhabited most of the mountain ranges in Nevada and several in southwestern Utah, but their current distribution within the study area is limited primarily to southern Nevada. The methodology for assessing potential impacts resulting from M-X deployment have been discussed at the beginning of the impact section.

Proposed Action

General

Figure 1.3.2.2-1 shows the relationship of bighorn sheep range to the conceptual project configuration. Since bighorn distribution is limited to only a few mountain ranges in the potential deployment area, direct project effects are anticipated only at the Coyote Spring OB site. Indirect effects would be expected at Lone Mountain and in the Grant Range, Snake Range, and Delamar Mountains as well as in the vicinity of the Coyote Spring OB.

Bighorn in the Nevada/Utah study occur in the mountain ranges of southern Nevada (Figure 1.3.2.2-1), and several migration routes between mountain ranges have been identififed. Because of their limited distribution and preference for rugged terrain, bighorn sheep are not likely to be directly affected by M-X in the DDA. Short-term indirect effects, however, could result from recreational activities of project personnel and their dependents during construction of the DDA. Bighorn sheep are tolerant of some human activity within their habitat, but such activities at water sites during the dry summer months, when bighorn sheep are concentrated within about 2 mi (3 km) of permanent water sources, could have detrimental effects on their populations. Studies of bighorn sheep and human use at a summer water site (Jorgensen, 1974) have shown that bighorn use of the site decreased approximately 50 percent on days when vehicle traffic was present. Thus, increased human activities at bighorn summer watering sites resulting from M-X-induced population growth could adversely affect the bighorn sheep populations in southern Nevada. Although hunting is closely regulated, illegal harvest occurs and would obviously affect bighorn abundance (Gustkey, E. 1980, 12/5/80, "Bighorn Sheep Kill Rate has become no Small Matter," L. A. Times, III, 18). Cumulative effects of MX and other projects in the study area would not be expected to occur in the DDA.

Indirect effects to bighorn sheep in the DDA would be expected to occur only during construction when a large number of people would be present. Construction camps in Ralston, Dry Lake, Snake and Railroad valleys would be within 25 mi (40 km) of bighorn sheep habitat at Lone Mountain (146 sheep), in the Grant Range (100 sheep), in the Delamar Mountains (50 sheep), and in the Snake Range (Rocky Mountain bighorn transplant sites). Once construction is completed few project-related people would be present in the DDA, thus reducing the potential for long-term effects on bighorn to a very low level.

Short-term abundance of bighorn sheep could be reduced in the Grant Range, Delamar Mountains, Snake Range, and at Lone Mountain as a result of receational activities and illegal harvest by consruction personnel. The level of reduction cannot be reasonably estimated, and long-term effects are expected to be minimal in these areas. No irreversible or irretrievable commitments of bighorn sheep resources in the DDA are anticipated.

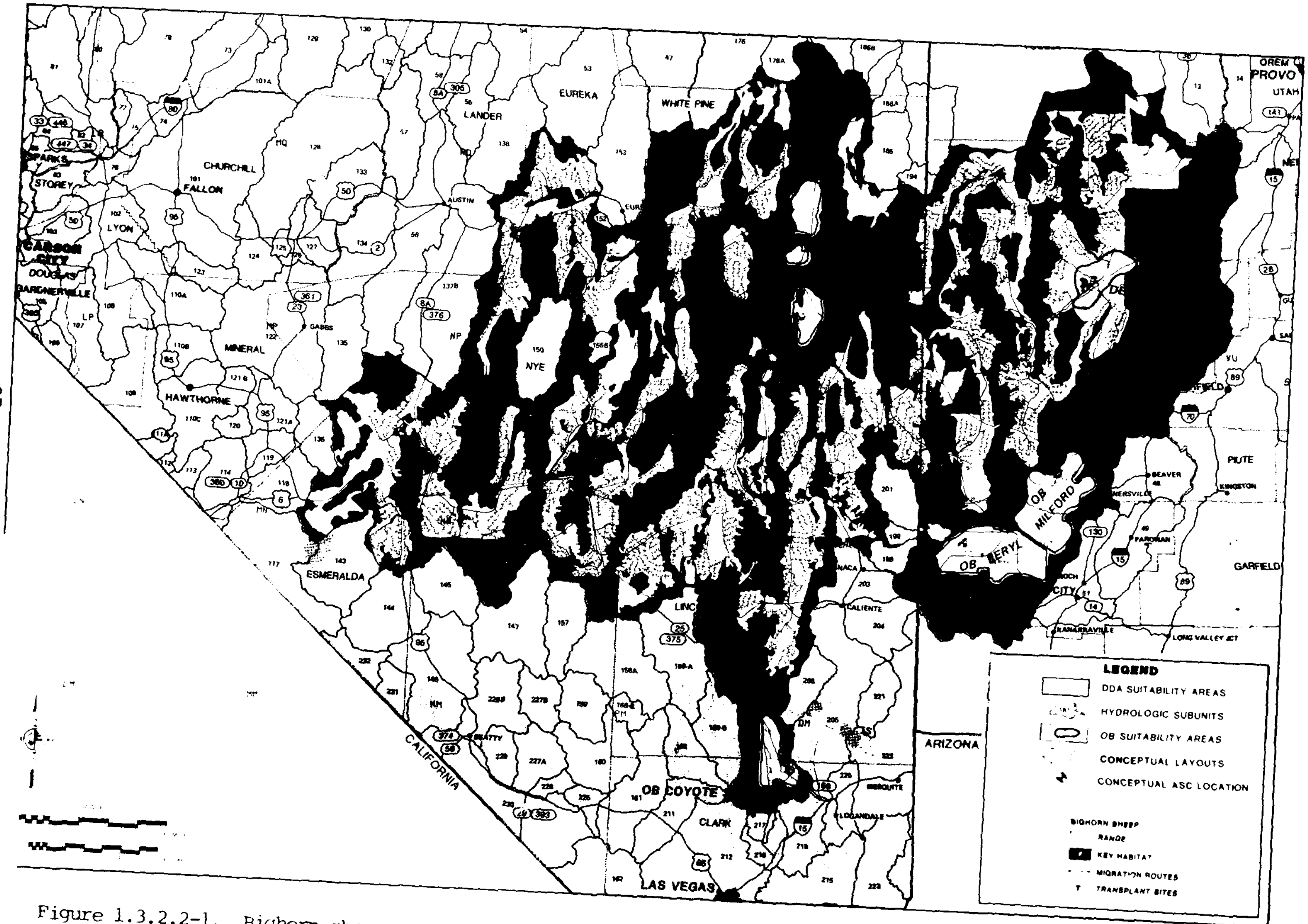

Figure 1.3.2.2-1. Bighorn sheep range and habitat and Proposed Action conceptual project layout.

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The effect of recreational activities and illegal harvest on bighorn sheep would be to reduce their numbers, which would then reduce other recreational opportunities, such as hunting and observation. Any decrease in population size for this valued species would be perceived as a significant impact by many people. Such impacts are predicted to occur over a short time and at only a few locations in the DDA. These effects could be avoided by implementing the mitigation measures described below.

The estimate of significant impact is a worst case prediction since much of the preferred habitat of bighorn sheep is often inaccessible to humans or in areas with no other attractive features, such as fishable streams or camping facilities. Table 1.3.2.2-1 summarizes the potential impact to bighorn sheep in the Nevada/Utah potential deployment area by hydrologic subunit. The effects are expected to be short term, and bighorn population recovery would require approximately 5 years based upon the demographic characteristics of bighorn sheep in the study area.

Mitigation measures that could be employed to reduce indirect impacts to bighorn sheep include:

- Control of domestic sheep movements, wild horses, and burros to reduce range overlap with bighorn sheep
- Water development on summer range
- Prohibition of possession of high power rifles by construction workers while stationed in construction camps, both on and off duty
- Restriction of recreational use, during the summer months, of bighorn watering sites in areas under governmental jurisdiction
- Strict enforcement of hunting laws by state authorities.

Operating Base (OB) Impacts

Figure 1.3.2.2-2 shows the relationship between bighorn sheep range and the operating base suitability areas around Coyote Spring Valley, Nevada; none are present near Milford, Utah.

Coyote Spring Valley, Nevada Area

The operating base suitability area overlaps bighorn sheep habitat in the Delamar Mountains, Meadow Valley Mountains and Arrow Canyon Range. The road from Highway 93 to Moapa crosses a bighorn migration route between the Meadow Valley Mountains and the Arrow Canyon Range. Increased traffic on the road could be expected to increase the incidence of bighorn road kills, probably in proportion to the traffic volume. The conceptual location of the OB in the suitability area would not cause any loss of bighorn sheep habitat, but areas of overlap do exist within the suitability envelope.

Siting an OB in Coyote Spring Wash is expected to have few direct effects on bighorn sheep. Indirect effects, however, could occur since bighorns inhabit all of the surrounding mountain ranges. The highest abundance location for bighorn sheep

Table 1.3.2.2-1. Potential impact to bighorn sheep in Nevada/Utah DDA for the Proposed Action and Alternatives 1-6.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	ABUNDANCE INDEX[1]	SHORT-TERM IMPACTS[2,3]	LONG-TERM IMPACTS[2,3]
	Subunits with M-X Clusters and DTN			
4	Snake	Moderate	High	No impact
5	Pine	No impact	No impact	No impact
6	White	No impact	No impact	No impact
7	Fish Springs	No impact	No impact	No impact
8	Dugway	No impact	No impact	No impact
9	Government Creek	No impact	No impact	No impact
46	Sevier Desert	No impact	No impact	No impact
46A	Sevier Desert-Dry Lake[4]	No impact	No impact	No impact
54	Wah Wah	No impact	No impact	No impact
137A	Big Smoky-Tonopah Flat	High	High	No impact
139	Kobeh	No impact	No impact	No impact
140A	Monitor—Northern	No impact	No impact	No impact
140B	Monitor—Southern	No impact	No impact	No impact
141	Ralston	No impact	No impact	No impact
142	Alkali Spring	No impact	No impact	No impact
148	Cactus Flat	No impact	No impact	No impact
149	Stone Cabin[4]	No impact	No impact	No impact
151	Antelope	No impact	No impact	No impact
154	Newark[4]	No impact	No impact	No impact
155A	*Little Smoky—Northern*	No impact	No impact	No impact
155C	Little Smoky—Southern	No impact	No impact	No impact
156	Hot Creek	No impact	No impact	No impact
170	Penoyer	No impact	No impact	No impact
171	Coal	No impact	No impact	No impact
172	Garden	Moderate	High	No impact
173A	Railroad—Southern	No impact	No impact	No impact
173B	Railroad—Northern	Moderate	High	No impact
174	Jakes	No impact	No impact	No impact
175	Long	No impact	No impact	No impact
178B	Butte—South	No impact	No impact	No impact
179	Steptoe	No impact	No impact	No impact
180	Cave	No impact	No impact	No impact
181	Dry Lake[4]	No impact	No impact	No impact
182	Delamar	Moderate	High	No impact
183	Lake	No impact	No impact	No impact
184	Spring	Moderate	High	No impact
196	Hamlin	No impact	No impact	No impact
202	Patterson	No impact	No impact	No impact
207	White River[4]	No impact	No impact	No impact
208	Pahroc	No impact	No impact	No impact
209	Pahranagat	No impact	Moderate	No impact
	Overall DDA Impact		High	No impact

3904-2

[1,2]
- No impact. (No animals present for Abundance Index.)
- Moderate impact. (Less than 150 present for Abundance Index.)
- High (significant) impact. (More than 150 present for Abundance Index.)

[3]Potential for impact was determined using the abundance of bighorn sheep and presence of a construction camp within 25 mi (40 km) of bighorn habitat.

[4]Conceptual location of Area Support Centers (ASCs).

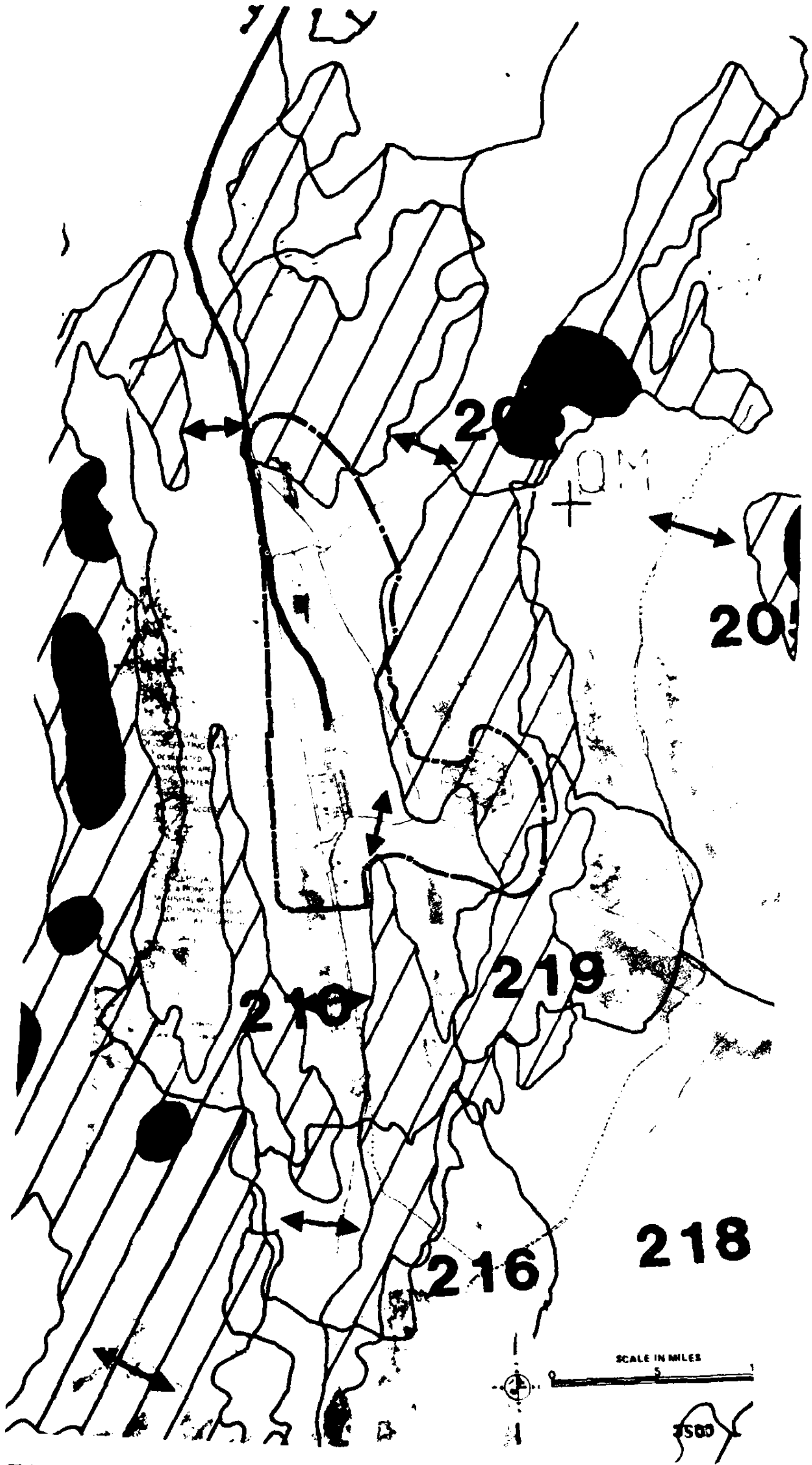

Figure 1.3.2.2-2. Bighorn sheep distribution in the vicinity of the Coyote Spring operating base.

in the state, the Sheep Range, is within 10 mi (16 km) of the proposed OB site, but road access is very limited. An estimated 732 animals inhabit this range with another 277 in the adjacent Las Vegas Range. Road access is fairly good for the Delamar, Meadow Valley, and Arrow Canyon Mountains. Recreational activities of construction and operations personnel and their dependents in these mountains, particularly during summer, could reduce bighorn population levels by decreasing kid survival rates if lactating ewes cannot get adequate water. Present data are insufficient to make reasonable estimates of illegal harvest, but this is another potential source of impact.

The only other project planned to occur concurrently with M-X in this area is the Harry Allen power plant in Dry Lake Valley approximately 25 mi (40 km) south of the proposed operating base location. The peak number of people associated with this project would be 8,000 and would increase the potential for impact to bighorn sheep in the Las Vegas and Arrow Canyon ranges.

The indirect effects resulting from population growth in the Coyote Spring area are expected to peak during construction when the maximum number of people (approximately 28,000) would be present in the area, and then, decline in proportion to the number of permanent residents (16,000) during operations. Many of these people would live in Las Vegas which is about 40 mi (64 km) south of the base site and would seek recreation either in Las Vegas or at Lake Mead 35 to 40 mi (56 to 64 km) to the southeast or south. Some, however, would choose to recreate in the nearby mountains. Recreation and development pressure in bighorn sheep habitat as well as competition with domestic livestock are currently limiting expansion of bighorn populations. The large influx of people resulting from M-X deployment would increase these pressures and could change the current stable population trend to a decline.

Siting an OB in Coyote Spring Wash would be expected to reduce the numbers of bighorn sheep in areas used for recreation by project-related people. Whether this becomes a long-term effect will depend upon the number of people remaining after decommissioning of the project.

No irreversible or irretrievable commitment of resources is anticipated unless the base or support community are built in bighorn habitat.

Table 1.3.2.2-2 summarizes the potential indirect impacts to bighorn sheep in the vicinity of the operating bases. The potential for significant impact to bighorns is predicted in four of the seven hydrographic subunits containing bighorns within 35 miles (56 km) of the OB. Potential for moderate impact is predicted for the other three subunits (Table 1.3.2.2-2).

Several mitigation measures could be implemented to reduce the potential impacts to bighorn sheep:

- o Development of water sites in areas not accessible for recreation
- o Restricted recreational use during summer of bighorn sheep water sites in areas under governmental jurisdiction.

Table 1.3.2.2-2. Potential impact to bighorn sheep resulting from construction and operation of M-X operating bases for the Proposed Action and Alternatives 1-8 (page 1 of 2).

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE[1] INDEX	ESTIMATED OVERALL IMPACT[2,3]				
			PROPOSED ACTION	ALT. 1	ALT. 2	ALT. 3	ALT. 4
NO.	NAME		COYOTE SPRING/ MILFORD	COYOTE SPRING/ BERYL	COYOTE SPRING/ DELTA	BERYL/ ELY	BERYL/ COYOTE SPRING
	Subunits or Counties within OB Suitability Area						
46	Sevier Desert	No impact			No impact		
46A	Sevier Desert - Dry Lake[4]	No impact			No impact		
50	Milford[4]	No impact	No impact				
52	Lund District	No impact	No impact	No impact		No impact	No impact
53	Beryl-Enterprise	No impact		No impact		No impact	No impact
179	Steptoe	No impact				No impact	
210	Coyote Spring	High	High	High	High		High
219	Muddy River Springs	Moderate	Moderate	Moderate	Moderate		Moderate
	Curry, NM						
	Hartley, TX[4]						
	Other Affected Subunits or Counties						
169B	Tikaboo	High	High	High	High		High
206	Kane Spring	Moderate	Moderate	Moderate	Moderate		Moderate
216	Garnet	High	High	High	High		High
217	Hidden Valley	High	High	High	High		High
218	California Wash	Moderate	Moderate	Moderate	Moderate		Moderate
	Overall Alternative Impact		High	High	High	No impact	High

3905-2

[1,2]
- No impact. (No animals present for Abundance Index.)
- Moderate impact. (Less than 150 present for Abundance Index.)
- High (significant) impact. (More than 150 present for Abundance Index.)

[3]Potential for impact was determined using the abundance of bighorn sheep and an indirect effect index developed by a model further described in ETA-30.

[4]Conceptual location of Area Support Centers (ASCs).

Table 1.3.2.2-2. Potential impact to bighorn sheep resulting from construction and operation of M-X operating bases for the Proposed Action and Alternatives 1-8 (page 2 of 2).

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE INDEX[1]	ESTIMATED OVERALL IMPACT[2,3]			
NO.	NAME		ALT. 5 MILFORD/ ELY	ALT. 6 MILFORD/ COYOTE SPRING	ALT. 7 CLOVIS/ DALHART	ALT. 8 COYOTE SPRING/ CLOVIS
	Subunits or Counties within OB Suitability Area					
46	**Sevier Desert**	□				
46A	**Sevier Desert & Dry Lake**[4]	□				
50	**Milford**[4]	□	□	□		
52	**Lund District**	□	□	□		
53	**Beryl-Enterprise**	□				
179	**Steptoe**	□	□			
210	**Coyote Spring**	■		■		■
219	**Muddy River Springs**	▥		▥		▥
	Curry, NM				□	□
	Hartley, TX[4]				□	
	Other Affected Subunits or Counties					
169B	**Tikaboo**	■		■		■
206	**Kane Spring**	▥		▥		▥
216	**Garnet**	■		■		■
217	**Hidden Valley**	■		■		■
218	**California-Wash**	▥		▥		▥
	Overall Alternative Impact		□	■	□	■

3905-2

[1,2]

□ No impact. (No animals present for Abundance Index.)

▥ Moderate impact. (Less than 150 present for Abundance Index.)

■ High (significant) impact. (More than 150 present for Abundance Index.)

[3]**Potential for impact was determined using the abundance of bighorn sheep and an indirect effect index developed by a model further described in ETA-30.**

[4]Conceptual location of Area Support Centers (ASCs).

Milford, Utah Area

Bighorn sheep do not inhabit any of the mountains near the Milford area, and no significant impacts are anticipated (Table 1.3.2.2-2).

Alternative 1

DDA Impacts

The potential impacts of constructing and operating the DDA for Alternative 1 are the same as those described for the Proposed Action.

Operation Base (OB) Impacts

Figure 1.3.2.2-2 shows the relationship of the bighorn sheep range with the operating base suitability area around Coyote Spring Valley, Nevada; none are present near Beryl, Utah.

Coyote Spring Valley, Nevada Area

The effects of siting an OB in Coyote Spring Wash are the same as those discussed for the Proposed Action. Table 1.3.2.2-2 summarizes the impacts for both OBs.

Beryl, Utah Area

No bighorn sheep inhabit the area near the proposed Beryl OB site. Some have been transplanted into Zion, however, no significant effects resulting from M-X are expected (Table 1.3.2.2-2).

Alternative 2

DDA Impacts

The potential impacts to bighorn sheep from construction and operating the DDA for this alternative are the same as those presented for the Proposed Action.

Operating Base (OB) Impacts

Figure 1.3.2.2-2 shows the relationship of bighorn sheep range with the operating base suitability area near Coyote Spring Valley, Nevada; none are present near Delta, Utah.

Coyote Spring Valley, Nevada Area

The impacts to bighorn sheep associated with siting an OB in Coyote Spring Wash are the same as those discussed for the proposed action. Potential impacts are summarized in Table 1.3.2.2-2.

Delta, Utah Area

No bighorn sheep habitat is present near the Delta OB site, and consequently, no significant impacts are predicted (Table 1.3.2.2-2).

Alternative 3

DDA Impacts

The potential impacts to bighorn sheep from construction and operating the DDA for this alternative are the same as those discussed for the Proposed Action.

Operating Base (OB) Impacts

Bighorn sheep range is not near the operating base suitability areas at Beryl, Utah and Ely, Nevada.

Beryl, Utah Area

No bighorn sheep currently inhabit the area near the proposed Beryl OB site. Some sheep have been transplanted to Zion National Park, but no significant impacts from M-X are expected (Table 1.3.2.2-2).

Ely, Nevada Area

No bighorn sheep presently inhabit the mountains near the proposed Ely OB site.

Alternative 4

DDA Impacts

Potential effects of DDA construction and operation are the same as discussed for the Proposed Action.

Operating Base (OB) Impacts

Beryl, Utah Area

No bighorn sheep currently inhabit the area near the proposed Beryl OB site. Some sheep have been transplanted to Zion National Park, but no significant impacts from M-X are expected (Table 1.3.2.2-2,.

Coyote Spring Valley, Nevada Area

The impacts of siting an OB in Coyote Spring Wash are the same as those discussed for the Proposed Action (Table 1.3.2.2-2).

Alternative 5

DDA Impacts

Potential impacts of DDA construction and operation on bighorn sheep are the same as described tor the Proposed Action.

Operating Base (OB) Impacts

Milford, Utah Area

No bighorn sheep occur near this proposed OB site, so no impacts are predicted (Table 1.3.2.2-2).

Ely, Nevada Area

No bighorn sheep occur near this proposed OB site, so no impacts are predicted (Table 1.3.2.2-2).

Alternative 6

DDA Impacts

Construction and operation of the DDA would impact bighorn sheep as discussed for the Proposed Action.

Operating Base (OB) Impacts

Milford, Utah Area

Since bighorn sheep do not inhabit the mountains near the Milford OB proposed site, no impacts are predicted (Table 1.3.2.2-2).

Coyote Spring Valley, Nevada Area

Potential impacts of siting a base in Coyote Spring Wash are the same as described for the Proposed Action (Table 1.3.2.2-2).

Alternative 7

Bighorn sheep are not present in the Texas/New Mexico study so project deployment in this area would have no impacts on this species (Table 1.3.2.2-2).

Alternative 8

General

Figure 1.3.2.2-3 shows the project configuration in relationship to bighorn sheep range in Nevada and Utah. This species is not present in the Texas and New Mexico potential deployment area. DDA construction activity would occur near bighorn sheep habitat in the Grant Range and Delamar Mountains while the OB site in Coyote Spring Wash is surrounded by bighorn habitat and migration routes.

DDA Impacts

Potential impacts to bighorn sheep resulting from DDA construction would be the same as those described for the Proposed Action, except that significant impacts would be expected for bighorns in only the sourthen portion of the Grant Range and in the Delamar Mountains (Table 1.3.2.2-3). Although project elements

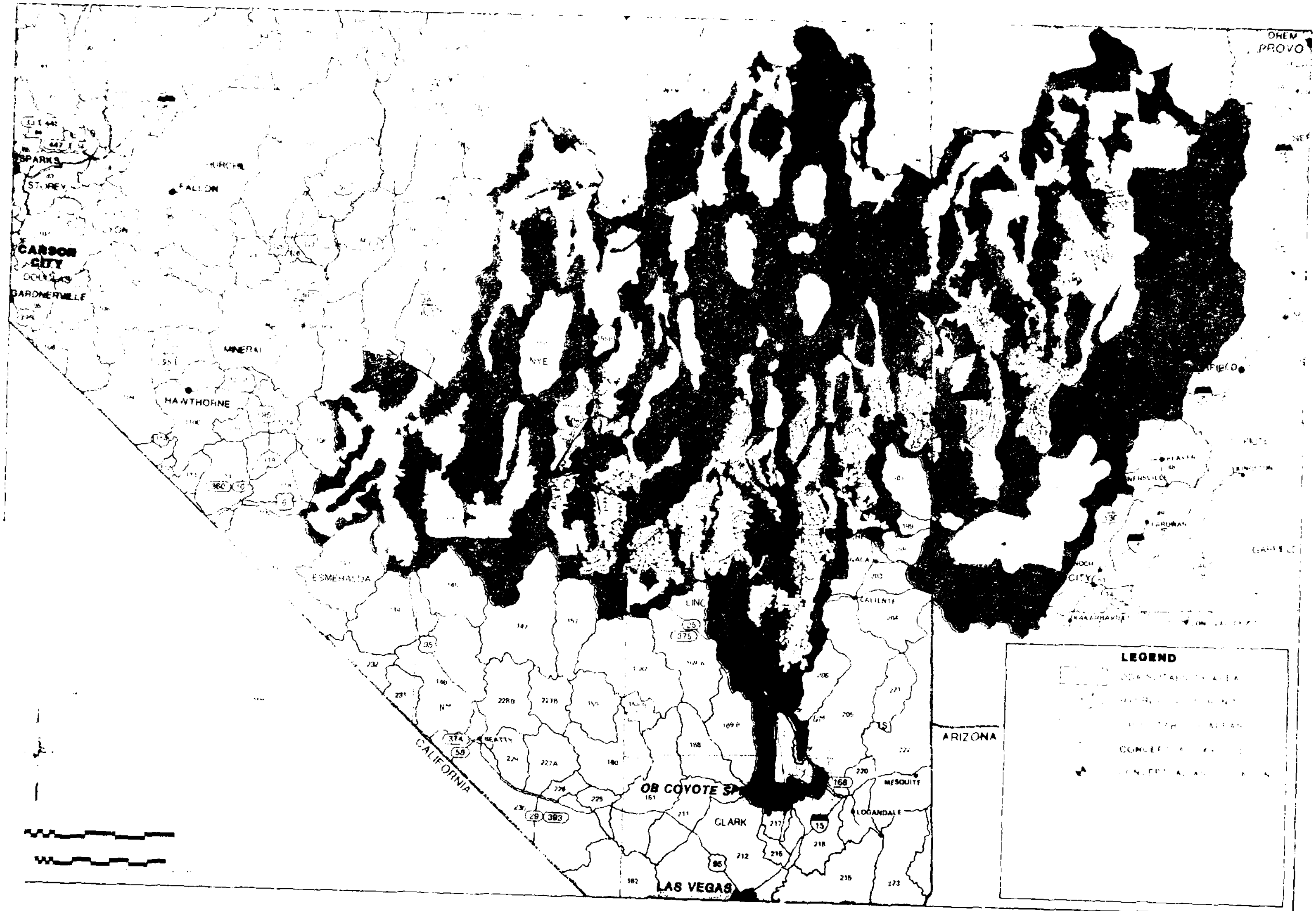

Figure 1.3.2.2-3. Bighorn sheep range and Alternative 8 conceptual layout in Nevada/Utah (none present in Texas/New Mexico).

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Table 1.3.2.2-3. Potential impact to bighorn sheep in Nevada/Utah DDA for Alternative 8.

HYDROLOGIC SUBUNIT NO.	NAME	ABUNDANCE INDEX[1]	SHORT-TERM IMPACTS[2,3]	LONG-TERM IMPACTS[2,3]
	Subunits or Counties with M-X Clusters and DTN			
4	Snake	Moderate	High	No impact
5	Pine	No impact	No impact	No impact
6	White	No impact	No impact	No impact
7	Fish Springs	No impact	No impact	No impact
46	Sevier Desert	No impact	No impact	No impact
46A	Sevier Desert-Dry Lake[4]	No impact	No impact	No impact
54	Wah Wah	No impact	No impact	No impact
155C	Little Smoky - Southern	No impact	No impact	No impact
156	Hot Creek	No impact	No impact	No impact
170	Penoyer	No impact	No impact	No impact
171	Coal	No impact	No impact	No impact
172	Garden	Moderate	High	No impact
173A	Railroad - Southern	No impact	No impact	No impact
173B	Railroad - Northern	Moderate	High	No impact
180	Cave	No impact	No impact	No impact
181	Dry Lake[4]	No impact	No impact	No impact
182	Delamar	Moderate	High	No impact
183	Lake	No impact	No impact	No impact
184	Spring	Moderate	High	No impact
196	Hamlin	No impact	No impact	No impact
202	Patterson	No impact	No impact	No impact
207	White River	No impact	No impact	No impact
	Bailey, TX	No impact	No impact	No impact
	Cochran, TX	No impact	No impact	No impact
	Dallam, TX	No impact	No impact	No impact
	Deaf Smith, TX	No impact	No impact	No impact
	Hartley, TX[4]	No impact	No impact	No impact
	Hockley, TX	No impact	No impact	No impact
	Lamb, TX	No impact	No impact	No impact
	Oldham, TX	No impact	No impact	No impact
	Parmer, TX	No impact	No impact	No impact
	Chaves, NM	No impact	No impact	No impact
	Curry, NM	No impact	No impact	No impact
	DeBaca, NM	No impact	No impact	No impact
	Guadalupe, NM	No impact	No impact	No impact
	Harding, NM	No impact	No impact	No impact
	Lea, NM	No impact	No impact	No impact
	Quay, NM	No impact	No impact	No impact
	Roosevelt, NM[4]	No impact	No impact	No impact
	Union, NM	No impact	No impact	No impact
	Overall DDA Impact		High	No impact

3906-2

[1,2]
- No impact. (No animals present for Abundance Index).
- Moderate impact. (Less than 150 present for Abundance Index).
- High (significant) impact. (More than 150 present for Abundance Index.)

[3]Potential for impact was determined using the abundance of bighorn sheep and presence of a construction camp within 25 mi (40 km) of bighorn habitat.

[4]Conceptual location of Area Support Centers (ASCs).

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would occur in Snake Valley, the construction camp would not be within 25 mi (40 km) of the Snake Range.

Operating Base (OB) impacts

Coyote Spring Valley, Nevada Area

Potential impacts of siting an OB at Coyote Spring are the same as those discussed for the proposed action. Table 1.3.2.2-2 summarizes the impacts.

Clovis, New Mexico Area

No bighorn sheep occur in the Texas/New Mexico study area.

Sage Grouse (1.3.2.3)

The sage grouse is distributed throughout the western U.S. It is distinguished by its dependence upon sagebrush vegetation and the congregation of males at strutting grounds (leks) during the breeding season to perform courtship displays. Much of the sage grouse key habitat (i.e. leks, brood use areas, and wintering grounds) in the study area is found in the valley bottoms and bajadas. The sage grouse is considered a significant species in the Great Basin, with respect to M-X development, because it is a highly valued game species whose range overlaps the M-X geotechnically suitable area. During the 1978 hunting season in Nevada, 6,647 hunters, approximately 1 percent of the state population, harvested 17,693 sage grouse. In past years, the number of hunters in the field has exceeded 9,000 (e.g., 9,180 in 1970 and 9,348 in 1974), with over 23,000 grouse harvested (Molini and Barngrover, 1979).

Potential significant project impacts were identified by combining distributional information (see Chapter 3 and below) with project information.

DDA - Nevada/Utah

Figure 1.3.2.3-1 shows the relationship between project configuration and sage grouse range and key habitat. Key habitat is defined as habitat which is necessary for the survival of a sage grouse population, that is, strutting grounds, brood-use areas, and wintering grounds. Because many areas of the Great Basin have not been adequately surveyed for key habitat, the amount of key habitat listed in this discussion should be considered the minimum present.

The potential effects of M-X deployment on sage grouse fall into three major categories: loss of habitat, surface water depletion, and effects of increased human population. Habitat loss would consist of direct loss of vegetation through scarification or else through behavioral avoidance of areas of construction or recreation (e.g. ORV and camping areas). Through field observation and knowledge of sage grouse behavior the Department of Wildlife in Nevada has estimated that construction activities and major roadways during construction would have an effect radius of approximately one mile (line-of-sight) (Molini, Nevada DOW 1980). Any key habitat within a one mile radius of construction activity of high human activity has a high likelihood of being abandoned (Molini, 1980). Initially, noise, construction activity, and the presence of people are expected to have a major negative effect.

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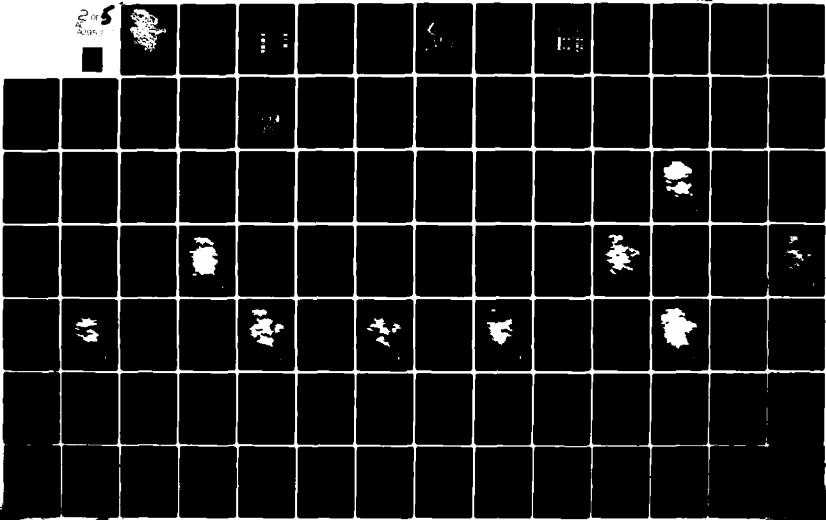


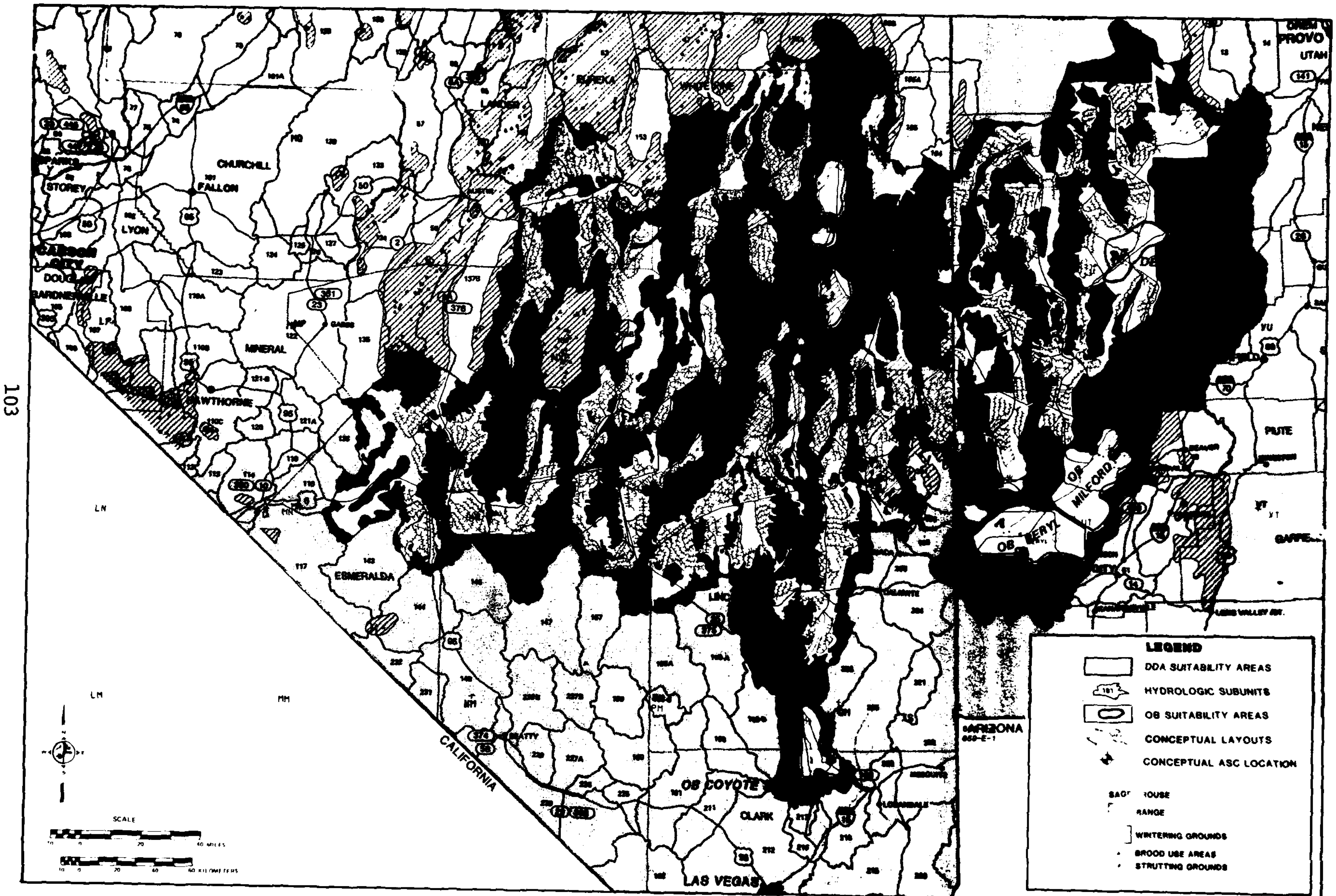


Figure 1.3.2.3-1. Sage grouse range and habitat and Proposed Action conceptual project layout.

However, some acclimation may occur with time. Reduction or loss of surface or groundwater would have a major effect in those valleys where this process causes a drying up of springs and wet meadows. Sage grouse depend upon these mesic areas for successful rearing of their broods. Effects from increased human populations are primarily through increased hunting activity (legal and illegal) and habitat loss due to behavioral avoidance of human activity by sage grouse.

Other projects planned for, proposed, or approved in the region will affect sage grouse, but major effects of these projects are expected to be localized. Large scale projects proposed for the region include Intermountain Power Project (IPP), White Pine Power Project (WPPP), Pine Grove Molybdenum Mine and Anaconda Nevada Molybdenum Project. None of these projects are expected to have the overall widespread effects on sage grouse in the deployment area that M-X deployment would have, or to add significantly to the effects of M-X in a cumulative sense. The localized effects that would be additive to M-X effects would be scarification and construction activities, plus the effects of increased human population. One example where expected localized M-X effects would be less than another proposed project would be in the case of the proposed Anaconda-Nevada Molybdenum mine. The intensity of scarification and human activity from this mine would be much greater (permanent loss of 2,600 acres of vegetation) than in an area where M-X construction would take place. However, the number of sage grouse populations in the M-X deployment area likely to be affected by this mine is small compared to sage grouse populations potentially affected by M-X.

Sage grouse habitat quality fluctuates from year to year in the Great Basin due to variation in climatic conditions (e.g., precipitation, temperature) and such disturbances as livestock grazing and human activity. Therefore, the effects of M-X could be compounded or lessened during a particular year depending upon climatic conditions or other non-M-X-related disturbances.

All effects ultimately result in a loss of habitat, a reduction of habitat quality, or a direct reduction in population. Habitat loss or reduction in quality eventually influences the size or vigor of the population through reduction in carrying capacity.

Table 1.3.2.3-1 lists the 29 hydrologic subunits in the M-X deployment area which are known to contain sage grouse range. Of these 29 hydrologic subunits, 19 would have direct loss of range (habitat) due to the construction of shelters, roadways, and associated developments. The maximum percentage of sage grouse range (habitat) directly removed in any subunit is less than 5 percent, and most subunits show less than 2 percent range (habitat) lost. Key habitat would be lost in 14 subunits (see Table 1.3.2.3-1). The estimated area (or number) of habitat lost is presented in Appendix 1.6.2.

Kobeh valley is the most heavily affected subunit in terms of loss of key habitat to M-X deployment. The project configuration laid over sage grouse distribution in this subunit will be used as an example to assess changes in sage grouse populations and productivity with time. Sage grouse populations tend to be closely associated with one or a small cluster of leks, areas traditionally used for communal courtship and breeding. Very little movement occurs between leks (Molini, 1980). Therefore, if a lek is removed or if sage grouse abandon a lek because of their intolerance of adjacent disturbance, that population has a high likelihood of being lost. Sage grouse would be most heavily affected during the

Table 1.3.2.3-1. Potential impact to sage grouse in Nevada/Utah DDA for the Proposed Action and Alternatives 1-6.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	ABUNDANCE INDEX[1]	SHORT- AND LONG-TERM IMPACTS OF KNOWN SAGE GROUSE RANGE AND KEY HABITATS[1]: % OF HYDRO-SUBUNIT RANGE DISTURBED	% OF LEK SITES DISTURBED	% OF BROOD-USE AREAS DISTURBED	% OF WINTERING GROUNDS DISTURBED	ESTIMATED SHORT- & LONG-TERM IMPACT[1,3]
	Subunits with M-X Clusters and DTN						
4	Snake		0	0	0	0	
5	Pine		2	0	0	0	
6	White		0	0	0	0	
7	Fish Springs		0	0	0	0	
8	Dugway		0	0	0	0	
9	Government Creek		0	0	0	0	
46	Sevier Desert		0	0	0	0	
46A	Sevier Desert & Dry Lake[2]		0	0	0	0	
54	Wah Wah		0	0	0	0	
137A	Big Smoky-Tonopah Flat		1	0	14	0	
139	Kobeh		1	45	28	2	
140A	Monitor—Northern		1	23	9	0	
140B	Monitor—Southern						
141	Ralston		0	0	0	0	
142	Alkali Spring		0	0	0	0	
148	Cactus Flat		0	0	0	0	
149	Stone Cabin[2]		1	0	0	0	
151	Antelope		2	100	1	0	
154	Newark[2]		1	15	0	0	
155A	Little Smoky—Northern		0	0	0	0	
155C	Little Smoky—Southern						
156	Hot Creek		0	0	0	0	
170	Penoyer		0	0	0	0	
171	Coal		0	0	0	0	
172	Garden		1	0	67	0	
173A	Railroad—Southern		3	0	8	0	
173B	Railroad—Northern						
174	Jakes		1	33	0	0	
175	Long		1	100	0	0	
178B	Butte—South		1	50	0	1	
179	Steptoe		0	0	0	0	
180	Cave		1	0	0	0	
181	Dry Lake[2]		0	0	0	0	
182	Delamar		0	0	0	0	
183	Lake		1	100	57	0	
184	Spring		1	0	0	0	
196	Hamlin		2	0	67	0	
202	Patterson		0	0	0	0	
207	White River[2]		1	0	0	0	
208	Pahroc		0	0	0	0	
209	Pahranagat		0	0	0	0	
	Overall DDA Impact		1%	22%	7%	1%	

3830-4

[1] No significant impact.
Low abundance levels.
Moderate impact or intermediate abundance levels.
High impact or high abundance levels

[2] Conceptual location of Area Support Center (ASC)

[3] Long term impact is less than short-term impact by an undetermined amount (see text). This is a worst case analysis.

construction phase of the project. Not only would 13 of 29 leks, 5 of 18 brood-use areas, and 163 acres of wintering grounds be directly lost to sage grouse by shelter and road construction but human activity in the area would increase by an estimated 1,752 people in 1988 due to the presence of a construction camp (#18). Behavioral avoidance of previously used habitat would be greatest during this time and may increase effective habitat loss several times over the area which is actually scarified.

Within the first two years of construction and operation, sage grouse abundance in Kobeh Valley might be expected to decrease 30 to 50 percent because of the 45 percent reduction in available lek sites and 28 percent reduction in available brood-use areas. The one wintering ground essential for winter survival in Kobeh valley has many shelters and roadways criss-crossing it, and the effective loss of this habitat for sage grouse may be greater than the 163 acres directly removed. After the first year of disturbance sage grouse may recover slightly if behaviorally avoided key habitat again becomes available. Sage grouse have been known to use leks adjacent to disturbed areas (Higby 1969). Because of this large long-term loss of key habitat sage grouse abundance may not recover in the forseeable future above 50-60 percent of current abundance. Natural revegetation of scarified key habitat areas would take on the order of 30 to 50 years, and hence would not be available for the original sage grouse populations.

Short-term productivity is expected to be only 50-70 percent of current productivity because of loss of key habitat and the presence of human activity associated with the construction camp. Long-term productivity is also likely to be in the 50-70 percent range because most of the key habitat loss would be permanent.

Loss of key habitat due to scarification or intense human activity is, in most cases, an irretrievable loss of resources required by sage grouse for survival. In some cases, and with intensive management, key habitat may be retrievable. Much of the habitat lost because of behavioral intolerance of construction-associated disturbances such as noise, traffic, and people could in many cases be recovered if managed properly.

Sage grouse are considered by state wildlife agencies within the Great Basin as a significant resource which is highly specialized, very dependent upon sagebrush vegetation, and sensitive to environmental disturbance. The Nevada Department of Wildlife considers any loss of key habitat a significant impact (Molini, 1980). Therefore the 14 hydrologic subunits previously listed, where M-X would directly remove key habitat, would have significant impacts upon sage grouse because of the project. Many subunits are inadequately surveyed in the study area, and many key habitat sites are probably not currently mapped, so more hydrologic subunits with M-X construction could be found to have significant impacts after more information is collected. Significant potential exists for avoiding or reducing effects to sage grouse by avoidance of key habitat areas.

Table 1.3.2.3-1 lists the abundances and level of impacts on sage grouse on a hydrologic subunit basis.

A major mitigation to reduce the level of effects on sage grouse would be to stake out shelter and road locations during the spring when sage grouse leks are active and most easily detected. An alternate method would be to accurately map

the lek and brood-use locations during spring (perhaps by air), and stake the shelters later. Lek and brood-use areas are usually small (1 to 10 acres), and could be avoided by minor adjustments in siting of the individual shelters in the field. Such avoidance would effect significant mitigation. A prohibition of firearms in construction camps and on the construction sites would reduce the effect of illegal taking and harassment. Prohibition or tight restrictions on ORV activity and camping sites would avoid destruction of sage grouse key habitat. Strict law enforcement would be necessary to make these mitigative measures useful.

Disturbed key habitat may be improved or restored through management techniques. Exclusion of cattle from key habitat areas during pertinent times of the year may benefit sage grouse by reducing habitat destruction or degradation. In those areas where sage grouse populations are lost due to their behavioral avoidance of M-X construction activities, transplanting of grouse back into these areas may be successful. Development of new water sources as a result of M-X construction needs has the potential to create new wet meadow habitat which could be used as brood-use habitat if located within 2 mi of a lek (see Chapter 4).

Operating Bases - Proposed Action

No significant adverse impacts to sage grouse are expected to result from the construction or operation of the Coyote Spring Wash OB because no sage grouse occur in this area.

No direct loss of sage grouse habitat would result from construction of a base site southwest of Milford (Figure 1.3.2.3-2). Over 4,200 acres of habitat could be lost to sage grouse, though, if the base is moved to the northeast part of the suitability envelope. Increased exploitation (both legally and illegally), is also likely to affect the population of sage grouse located near Minersville, Utah. Because of a substantial increase in the human population in this area (estimated at approximately 13,000 people for the life of this project), sage grouse are expected to be negatively affected by increased recreation, particularly off-road vehicle (ORV) use. As cited in the discussion of the DDA, many investigators have found that destruction of sagebrush near a strutting ground can severely reduce sage grouse use of the strutting ground or cause abandonment of the strutting ground altogether. These effects are expected to last throughout the operational phase of the project (30-50 years) during which time people associated with the project are expected to hunt sage grouse and operate ORVs in these areas. ORV activity will be particularly harmful to sage grouse if the base is located in the northeast part of the envelope, directly in sage grouse habitat. ORV use can be expected to be very high within 3 miles of the base (Rajala, 1980). Productivity for this area is expected to be lowered even after project decomissioning because, to a large measure, productivity of sage grouse is tied to quality of the sagebrush in their habitat and recovery of sagebrush is expected to take 50-75 years. These impacts are significant because sage grouse are a prized game bird, and hunting opportunities would be lowered due to loss of sage grouse habitat because of construction, recreational degradation of their habitat, and expected increased illegal exploitation. Direct impacts are avoidable if the base is not sited in the northeast part of the envelope. Both of the recreational impacts are avoidable. Areas known to have sage grouse could be posted to prohibit ORV activity. Along with posted signs, patrols could be started in sage grouse areas to monitor ORV use and illegal harvesting. Limitation of human activities in these areas during the months

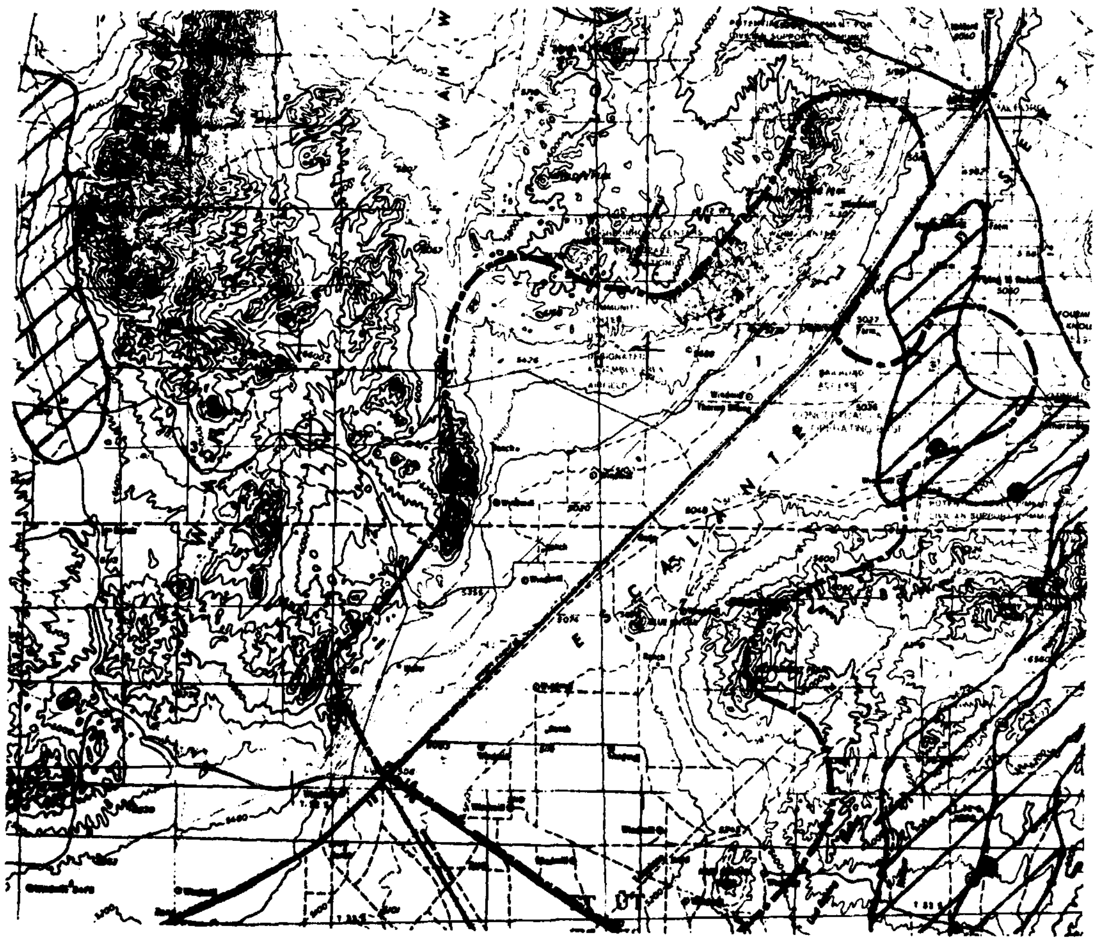


Figure 1.3.2.3-2. Sage grouse distribution in the vicinity of the Milford operating base.

encompassing courtship, nesting, and brood rearing would help ensure reproductive success. Table 1.3.2.3-2 compares the effects of the Coyote Spring Wash and Milford OBs on sage grouse. Milford has significant indirect effects on sage grouse in four hydrologic subunits. Coyote Spring Wash OB has minimal overall impacts to sage grouse. The overall indirect effect of the bases would have a moderate impact to sage grouse from the Proposed Action.

Alternative 1

The impacts for the DDA of Alternative 1 are the same as those discussed for the Proposed Action.

Figure 1.3.2.3-3 overlays sage grouse distribution in Nevada and Utah with the location of the Beryl OB location.

No significant adverse impacts to sage grouse will occur due to the base at Coyote Spring Wash because no sage grouse occur in this area.

Some adverse indirect impacts to sage grouse are likely to occur because of a base being located at Beryl, Utah, due to a significant increase in population in a presently sparsely-populated area. The population is expected to increase by aproximately 13,000 people during the time the base is operational. Sage grouse occur in both southern Pine and Hamblin Valleys to the north of this base (Figure 1.3.2.3-3). These areas would most likely receive the bulk of sage grouse hunters (both legally and illegally) from Beryl because of their closeness to the base, and also may receive other human recreation. These activities would serve to lower sage grouse numbers because more grouse would be directly killed and habitat would be degraded, mostly by ORV use. This lowering of sage grouse numbers would likely be substantial if ORV use is high, but the impacts overall would be smaller than for Ely where approximately 4,500 acres of habitat would be directly removed because of base construction. These effects would be long-term and should lower the productivity of the population at least in Pine Valley and perhaps most of Hamblin Valley since these areas are the closest area available to hunt sage grouse. This impact is only moderately significant for the Beryl OB because the areas with sage grouse are approximately 15-20 mi away and will probably not receive heavy ORV use. As mentioned previously, legal hunting would likely be heaviest in these areas because they are the closest areas for hunting of sage grouse, but should not greatly reduce sage grouse numbers because grouse, like quail, are much more dependent on habitat quality for population stability. The impacts at this base are very similar to the Milford OB and the same mitigation measures would apply. Table 1.3.2.3-2 indicates that the Coyote Spring OB has minimal negative effects to sage grouse but the Beryl OB would have significant negative impacts in 5 hydrologic subunits. The overall impact of the two OBs is moderate to sage grouse because of Alternative 1.

Alternative 2

The impacts for the DDA of Alternative 2 are the same as those discussed for the Proposed Action.

No significant impacts to sage grouse will occur due to a base at Coyote Spring Wash because no sage grouse occur in this area.

Table 1.3.2.3-2. Potential overall impact to sage grouse which could result from construction of operating bases for the Proposed Action and Alternatives 1-4.

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE INDEX[1]	ESTIMATED OVERALL IMPACT[1]				
			PROPOSED ACTION	ALT. 1	ALT. 2	ALT. 3	ALT. 4
NO.	NAME		COYOTE SPRING/ MILFORD	COYOTE SPRING/ BERYL	COYOTE SPRING/ DELTA	BERYL/ ELY	BERYL/ COYOTE SPRING
	Subunits or Counties within OB Suitability Area						
46	Sevier Desert	No	No	No	No	No	No
50	Milford[2,4]	High	High	No	No	No	No
52	Lund District	No	No	No	No	No	No
53	Beryl-Enterprise	No	No	No	No	No	No
179	Steptoe	High	No	No	No	High	No
210	Coyote Spring	No	No	No	No	No	No
219	Muddy River Springs	No	No	No	No	No	No
	Curry, NM	No	No	No	No	No	No
	Hartley, TX[3,4]	No	No	No	No	No	No
	Other Affected Subunits or Counties						
4	Snake	Moderate	No	No	High	Moderate	No
5	Pine	High	Moderate	Moderate	Moderate	High	Moderate
9	Government Creek	High	No	No	Moderate	No	No
48	Beaver	High	High	High	No	High	High
49	Parowan	High	High	High	No	High	High
50	Milford[2]	High	No	Moderate	No	Moderate	Moderate
51	Cedar	High	Moderate	Moderate	No	Moderate	Moderate
154	Newark[2]	High	No	No	No	Moderate	No
155	Little Smoky—N & S	High	No	No	No	Moderate	No
174	Jakes	High	No	No	No	High	No
175	Long	High	No	No	No	Moderate	No
178	Butte	High	No	No	No	Moderate	No
180	Cave	High	No	No	No	High	No
183	Lake	High	No	High	No	High	High
184	Spring	High	No	No	No	High	No
185	Tippet	Moderate	No	No	No	No	No
196	Hamlin	High	High	High	No	High	High
198	Dry	Moderate	Moderate	Moderate	No	Moderate	Moderate
201	Spring	High	High	High	No	No	High
202	Patterson	High	No	High	No	No	No
207	White River[2]	High	No	No	No	High	No
	Overall Alternative Impact		Moderate	Moderate	No	High	Moderate

3831-2

[1]
- No impact. (No sage grouse present for Abundance Index.)
- Low impact.
- Moderate impact. (Sage grouse range present for Abundance Index.)
- High (significant) impact. (Sage grouse range and key habitat present for Abundance Index.)

[2]Conceptual location of Area Support Center (ASC) for Proposed Action and Alternatives 1-6.

[3]Conceptual location of Area Support Center (ASC) for Alternative 7.

[4]Conceptual location of Area Support Center (ASC) for Alternative 8.

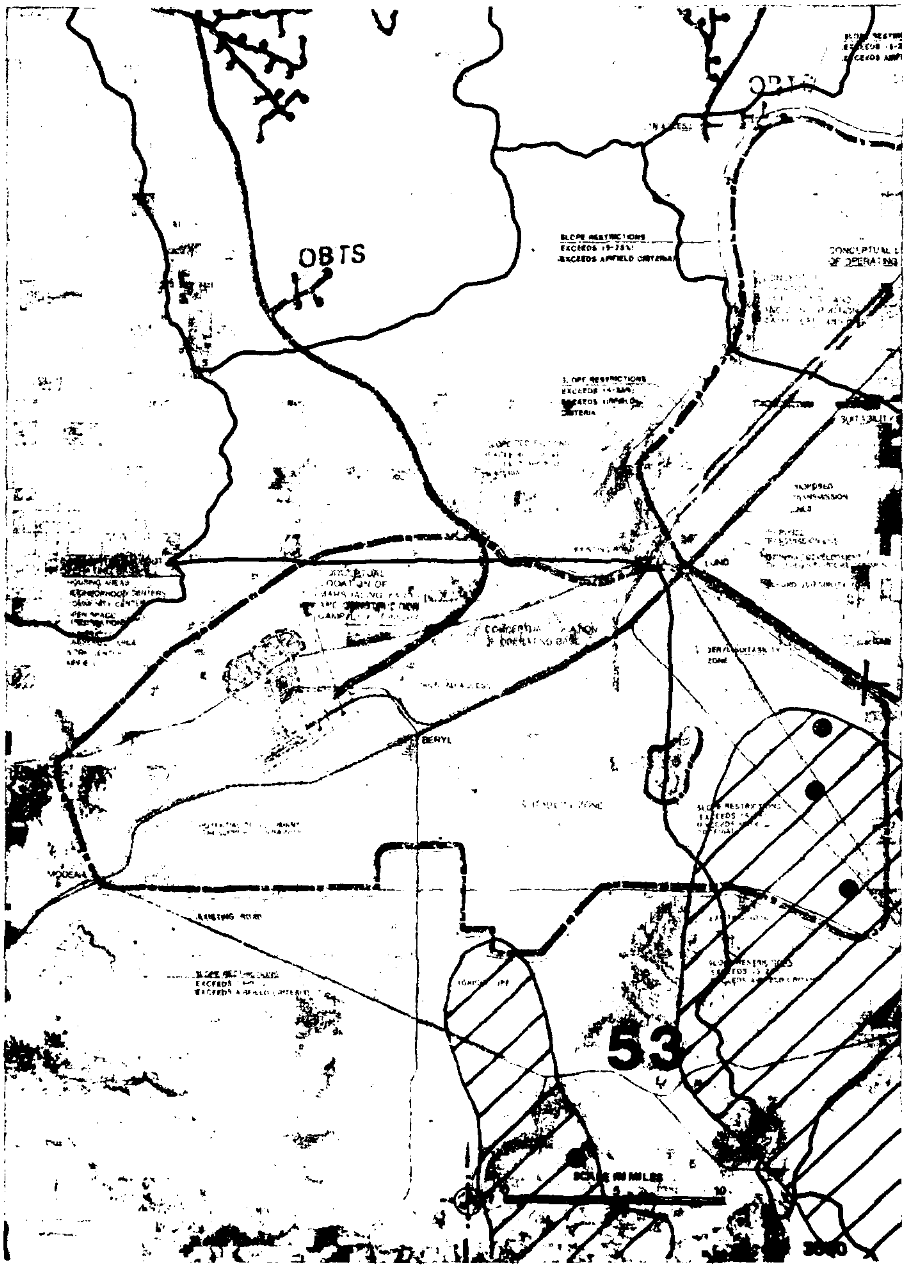


Figure 1.3.2.3-3. Sage grouse distribution in the vicinity of the Beryl operating base.

Few impacts are expected to occur to sage grouse because of a base at Delta. Sage grouse occur approximately 30 miles northwest of the base site in the Sheeprock Mountains and about 80 miles northwest in the Deep Creek Mountains. Hunting may increase in these areas, particularly in the Deep Creek Mountains because of their natural beauty and attractiveness, but this is not expected to be significant. Table 1.3.2.3-2 shows only the Snake hydrographic subunit being significantly impacted by people from the Delta OB and this is caused mostly by its inherent attractiveness. Overall impacts to sage grouse would be low because of the bases of Alternative 2.

Alternative 3

The impacts for the DDA of Alternative 3 are the same as those discussed for the Proposed Action.

The discussion for the Beryl OB site can be found under Alternative 1.

The large suitability envelope south of Ely and the other large envelope north of McGill both have a high potential for directly destroying sage grouse habitat. On the other hand, the small envelope just north of Ely has a very low potential for intersecting any sage grouse habitat. The suitability envelope to the south of Ely has virtually a 90-100 percent probability of removing 4,500 acres of sage grouse habitat because sage grouse occur throughout this area (Figure 1.3.2.3-4). The present base location will remove 4,500 acres of sage habitat because of its location. There is a 50 percent probability (approximately) of removing this amount of habitat in the large northern envelope because only 50 percent of this area contains sage grouse (Figure 1.3.2.3-4). Destruction of sage brush will reduce the carrying capacity of the area and will likely lead to a reduction of sage grouse numbers. Increased human population will also cause impacts to sage grouse and these effects will not vary because of the suitability envelope used. The large population increase, estimated to be 14,400 people at Ely and at the base (the present population of Ely is about 5,000), will lead to an increase in hunters. Areas 20 to 30 mi north and south of Ely which contain sage grouse are likely to be the most heavily exploited, both legally and illegally. This local exploitation will lower sage grouse numbers and may lead to local extirpations. Another impact from increased population would be the increased ORV use. This recreational activity would also be heaviest locally (approximately 3 mi around a population center) and lead to severe degradation of the habitat (Rajala, pers. comm. 1980). This degradation would also reduce sage grouse numbers due to a loss of forage and brood use areas. These people-related impacts will be magnified by the addition of the White Pine Power Project which is expected to add approximately 800 more people to Ely. Present population trends for sage grouse are decreasing in this area due partially to habitat deterioration in White Pine County (Molini & Barngrover, 1979).

The addition of a base at Ely with the attendant increased human population will continue this trend downward throughout the area and particularly so in the area 10-30 mi around Ely. These can be expected to be long-term impacts because the effects of base personnel will continue for the 30-50 year life of the M-X project and beyond this until the population of Ely is reduced and the land around the base and Ely is restored to its present condition. These are very significant impacts because the effects on local populations of sage grouse near Ely and the

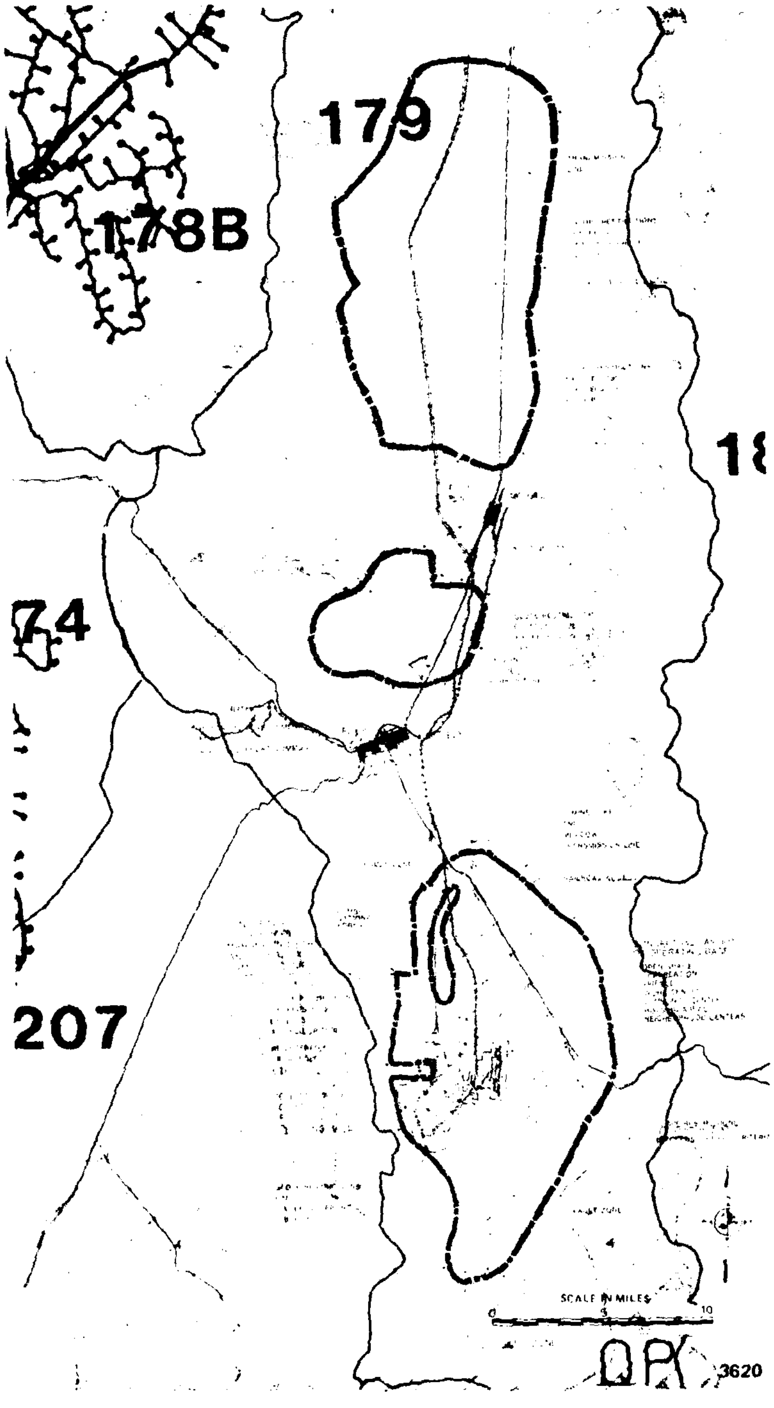


Figure 1.3.2.3-4. Sage grouse distribution in the vicinity of the Ely operating base.

potential base will be large. Some of the impacts are unavoidable because the potential base will be set directly on sage grouse habitat and will unavoidably lower sage grouse numbers. The people-related impacts are avoidable if areas with sage grouse can be sufficiently monitored to limit ORV use and illegal exploitation. Additionally, hunting zones can be established to spread out the legal hunting to lessen the impacts in localized areas. Table 1.3.2.3-2 compares the effects of the Beryl and Ely OBs on sage grouse. Both of these bases will have significant indirect impacts from people recreating in 14 hydrologic subunits and Ely will also have direct impacts. This alternative is one of the two worst alternatives for sage grouse along with Alternative 5.

Alternative 4

The impacts for the DDA of alternative 4 are the same as those discussed for the proposed action.

The discussion for the Beryl base site can be found under Alternative 1.

No significant adverse impacts to sage grouse will occur due to a base at Coyote Spring Wash because no sage grouse occur in this area.

Table 1.3.2.3-2 indicates that 6 hydrologic subunits would be significantly impacted by the bases of Alternative 4. The overall impact to sage grouse from this alternative is moderate.

Alternative 5

The impacts for the DDA of Alternative 5 are the same as those discussed for the proposed action.

The discussion for the Milford base site can be found under the Proposed Action.

The discussion for the Ely base site can be found under Alternative 3.

Table 1.3.2.3-3 shows that this alternative, like Alternative 3, has a significant indirect impact on sage grouse.

Alternative 6

The impacts for the DDA of Alternative 6 are the same as those discussed for the Proposed Action.

The main discussion for this base site can be found under the Proposed Action. Because the Milford OB is a first base in this alternative there are more impacts to sage grouse than when it is a second base simply because the population goes up to about 17,000 people from 13,000.

No significant adverse impacts to sage grouse will occur due to a base at Coyote Spring Wash because no sage grouse occur in this area.

Table 1.3.2.3-3 indicates a higher impact to sage grouse from this alternative compared to the Proposed Action which uses the same bases. This is due to Milford

Table 1.3.2.3-3. Potential overall impact to sage grouse which could result from construction to operating bases for Alternatives 5-8.

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE INDEX[2]	ESTIMATED OVERALL IMPACT[1]			
NO.	NAME		ALT. 5 MILFORD/ ELY	ALT. 6 MILFORD/ COYOTE SPRING	ALT. 7 CLOVIS/ DALHART	ALT. 8 COYOTE SPRING/ CLOVIS
	Subunits or Counties within OB Suitability Area					
46	Sevier Desert					
50	Milford[a,b]					
52	Lund District					
53	Beryl-Enterprise					
179	Steptoe					
210	Coyote Springs					
219	Muddy River Springs					
	Curry, NM					
	Hartley, TX[c]					
	Other Affected Subunits or Counties					
4	Snake					
5	Pine					
6	Government [illegible]					
48	Beaver					
49	Parowan					
[illegible]	Mil[illegible]					
[illegible]	Cedar					
154	Newark					
155	[illegible]					
174	Jakes					
175	Long					
178	Butte					
18[illegible]	Cave					
18[illegible]	Lake					
184	Spring					
18[illegible]	Tippet					
19[illegible]	Hamlin					
198	Dry					
2[illegible]	Spring					
2[illegible]	Patterson					
2[illegible]7	White River[a]					
	Overall Alternative Impact					

3832-1

- No impact. (No sage grouse present for Abundance Index.)
- Low impact.
- Moderate impact. (Sage grouse range present for Abundance Index.)
- High (significant) impact. (Sage grouse range and key habitat present for Abundance Index.)

[a] Conceptual location of Area Support Center (ASC) for Proposed Action and Alternatives 1-6.

[b] Conceptual location of Area Support Center (ASC) for Alternative 7.

[c] Conceptual location of Area Support Center (ASC) for Alternative 8.

being a first base with more people than when it is a second base.

Alternative 7

There will be no impacts to sage grouse due to the DDA because sage grouse do not occur in this basing region.

No sage grouse occur in New Mexico, so a base at Clovis would not have an impact on this resource.

No sage grouse occur in Texas, so a base at Dalhart would not have an impact on this resource.

Alternative 8

See Discussion under the Proposed Action.

Fifty percent of the clusters (100) proposed for deployment under the Proposed Action are eliminated from the Nevada/Utah area and placed in the Texas/New Mexico deployment area. The remaining clusters are concentrated in the south-eastern half of the full basing deployment area in Nevada/Utah. The kinds of impacts upon sage grouse are expected to be the same under Alternative 8.

Figure 1.3.2.3-1 shows the relationship between project configuration and sage grouse range and key habitat. Alternative 8 will have no effect upon sage grouse in the Texas/New Mexico deployment area because this species is not present.

See Discussion under the Proposed Action.

The kinds of effects upon sage grouse from split-basing deployment are expected to be the same as under full deployment in Nevada/Utah. Other future projects in the Great Basin that, along with M-X, may have a cumulative impact upon sage grouse are expected to be the same as under full deployment in Nevada/Utah, except for the Anaconda-Nevada Molybdenum mine. This project will not have a cumulative effect with M-X because M-X will not be in west-central Nevada under split basing.

Under split basing deployment 14 hydrologic subunits having sage grouse habitat would be disturbed (see Table 1.3.2.3-1) as compared to 21 subunits having sage grouse habitat directly affected under full deployment. Key habitat would be directly disturbed in only three subunits: Lake Valley (#183) - one out of one known leks and four out of seven known brood-use areas; Hamlin Valley (#196) - two out of three brood-use areas; and Garden Valley (#172) - two out of three brood-use areas. The maximum percentage of sage grouse range directly removed within any impacted subunit would be approximately 1.5 percent. The criterion for a significant effect upon sage grouse within a watershed is loss of key habitat. Therefore, only three subunits are significantly affected under split basing, while 12 watersheds are significantly affected under the proposed action.

Lake Valley is the most heavily affected subunit in terms of key habitat loss to M-X split-basing deployment. The effect of key habitat loss and human activity would be greatest during the construction phase of deployment. Only one lek is

known in Lake Valley, and it would be eliminated by M-X. If this is the only lek in the watershed, that sage grouse population would be permanently lost. However, it is possible that additional leks exist, some of which may also be impacted by M-X. If other leks exist, recovery would occur over three to five years for key habitat behaviorally avoided by the birds during construction because of human activity, but not destroyed. This assumes that animals avoiding project intersections with key habitat die or do not reproduce during their avoidance. Recovery may reach 70 to 90 percent of current abundance. A loss of four out of seven known brood-use acres would hamper recovery and perhaps keep abundance down to the 70 to 80 percent of pre-project levels.

Short-term productivity would be expected to drop 20 to 40 percent because of direct and indirect key habitat loss, but long-term productivity may approach current levels (90 - 95 percent). In a comparison of impacts of the proposed action and split basing deployment on sage grouse, split basing has a much smaller negative effect upon this species.

Table 1.3.2.3-1 lists the abundances and significance of impacts on sage grouse on a hydrologic subunit basis.

No significant adverse impacts to sage grouse will occur due to a base at Coyote Spring Wash because no sage grouse occur in this area.

No sage grouse occur in New Mexico, so a base at Clovis would not have an impact on this resource.

Lesser Prairie Chicken (1.3.2.4)

The lesser prairie chicken is closely related to the sage grouse and is its approximate ecological analogue in the Texas/New Mexico High plains. The lesser prairie chicken is considered a signficant species because it is a native game bird with declining abundance, as a result of habitat loss, throughout its geographic range, in Texas, New Mexico, and Oklahoma. In 1978, the harvest was 1,248 birds in New Mexico and 87 in Texas. It is restricted to shortgrass prairie and uses agricultural land for forage or breeding. Its present distribution reflects this sensitivity to signficant habitat alteration. It will use disturbed areas, even oil pads, for leks (strutting grounds) much as sage grouse, but requires shortgrass prairie for brood areas, and seems to seek out shinnery oak scrub for food in winter. M-X project elements intersect with lesser prairie chicken habitat in Bailey and Cochran counties, Texas, and Chaves, Lea, and Roosevelt counties, New Mexico.

Level of direct project impact was based on area of habitat permanently and/or temporarily removed due to construction activities. Indirect impacts were assumed to be low because hunting is regulated.

To evaluate levels of impact, abundance, defined as high for key habitat and moderate for range, was combined with proportion of habitat loss to give three levels. Impact was considered signficant in counties where more than one percent of land was disturbed and the area was known to have breeding populations, moderate where only range was known, and low where the species was absent.

Proposed Action

Lesser prairie chicken is not found in Nevada and Utah.

Alternative 1 through 6

The lesser prairie chicken is not found in Nevada and Utah.

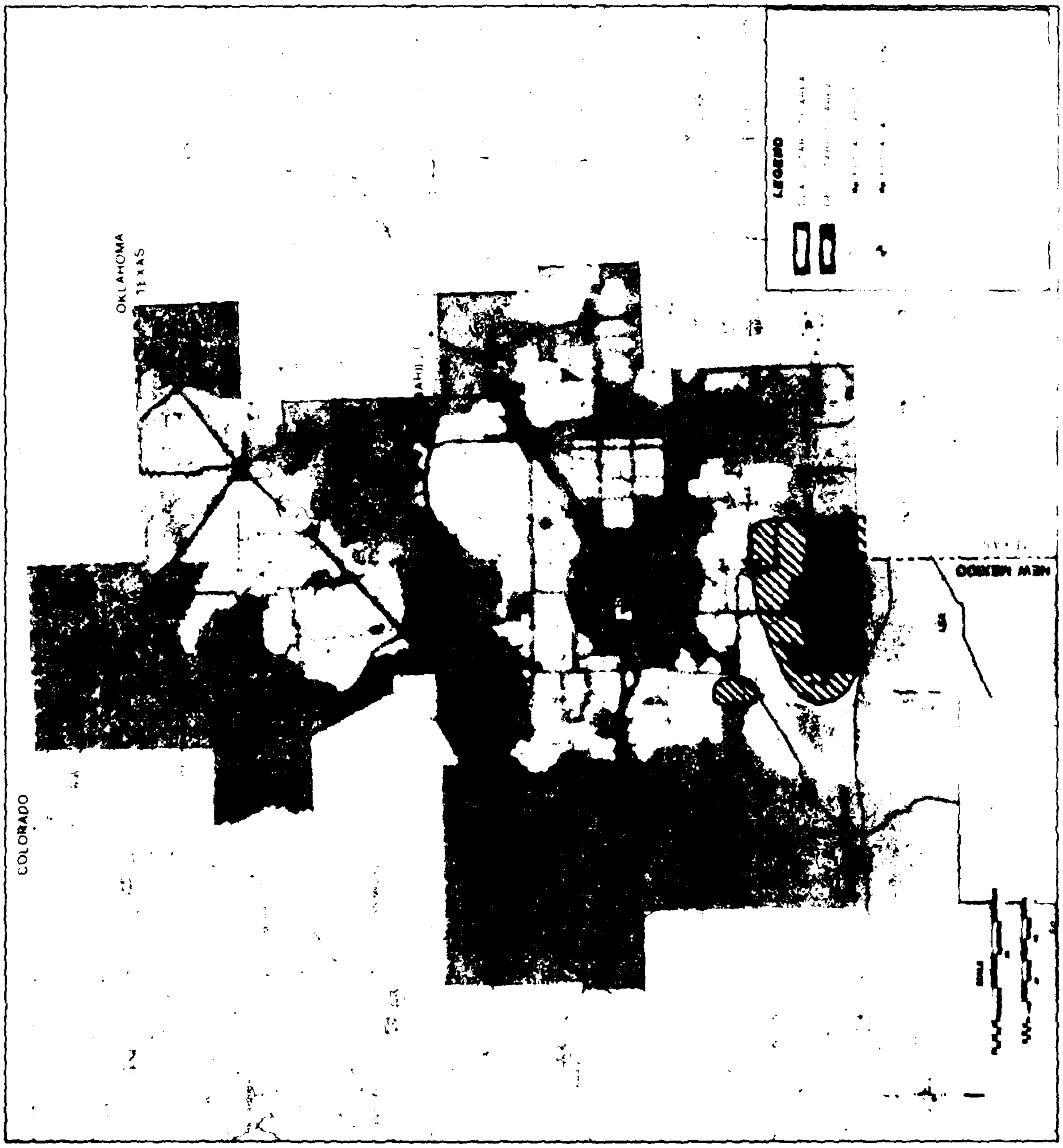
Figure 1.3.2.4-1 shows lesser prairie chicken ranges juxtaposed with a map of conceptual M-X project elements.

Potential effects of M-X deployment on the lesser prairie chicken, fall into two major categories: construction activities and increased human population. Water use is not an issue because M-X demand is expected to be met from the Ogallala aquifer and because the lesser prairie chicken does not need open water. Construction activities of concern include land disturbance, both short and long-term, and noise, which is short-term. Land disturbance involves habitat temporarily lost during project construction and that permanently lost to emplacement of facilities. Restoration of native vegetation would possibly allow subsequent use of temporarily disturbed areas by prairie chicken. Noise from construction activities is likely to scare off nearby birds, but the behavioral avoidance distance is unknown. If noise is close to leks or brood areas, birds could be induced to abort mating behavior or abandon nests, causing some loss of the population. If appropriate habitat is not available nearby, productivity for the affected birds will dimish. This effect depends upon the proximity of construciton activities to leks and brood areas during spring and summer. The general result of short-term habitat loss is population reduction, followed by recovery to a new level that would be determined by the amount and type of habitat permanently lost. Lesser prairie chicken will use the cleared areas for leks, but brood areas are found only in relatively undisturbed shortgrass prairie.

Effects due to increased human population would include possible increased legal and illegal harvest during construction and potential habitat disturbances from ORV recreation. Increased hunting pressure is likely to be small since project-induced population growth is expected to be less than 15 percent of the present population. Effects of increased hunting pressure on this species should be minimal because the species is managed as a game bird with limits on harvest set to maintain huntable populations. Illegal harvest is difficult to assess, but could have measureable effects. ORV use is again difficult to quantify, but lesser prairie chicken habitat includes sandhills and shinnery oak scrub, which now attracts ORV users in New Mexico, so there is potential for habitat disturbance from this source.

Some leks and especially potential brood areas will be irretrievably lost to M-X project elements, but how much this will depress the population from baseline levels cannot be estimated at present. Tier 2 environmental analysis will identify the potential site-specific impacts associated with leks and brood areas. New Leks and brood areas can be established if old ones are lost, provided suitable habitat is available.

Loss of some habitat is unavoidable, due to the necessity to site project elements within the range of the species if siting in Texas/New Mexico is selected. Information on the location of leks, brood areas, and wintering areas would allow


OKLAHOMA
TEXAS
COLORADO
NEW MEXICO
LEGEND

more careful siting of project elements to avoid these critical habitats and will be gathered if Texas/New Mexico is selected. The significance of population loss for a regulated game bird is as much societal as ecological. Any reduction in bag limits which could be attributed to M-X deployment would be considered significant by hunters and state game agencies.

Table 1.3.2.4-1 presents data on lesser prairie chicken distribution, estimated direct habitat loss, and impact level by county. Impact was judged low, moderate, or high (significant) by considering habitat loss, abundance, hunting areas, and county-wide information on breeding populations. The scoring was based on the likelihood of temporary or permanent population loss.

Mitigation of permanent habitat loss due to project elements is difficult. The severity of habitat loss, however, depends strongly on knowledge of lek and brood area locations. When these are known, onsite avoidance will result in far less impact on the populations than otherwise. Temporary effects due to construction are more mitigable. Minimizing temporarily-disturbed areas results in smaller short-term habitat loss. Restoration of this area to shortgrass prairie after completion of construction should allow some recovery of the prairie chicken population. Construction timetables resulting in only small portions of the range being used at any one time would allow displaced birds to move to completed areas, rather than forcing them out of the area altogether. When brood areas and leks are known, construction would be scheduled in or near these areas in late summer, fall, or winter to minimize disturbing the reproductive cycle.

Alternative 7

Neither Clovis nor Dalhart is in or near lesser prairie chicken range, so no effects are expected.

Alternative 8

There are no lesser prairie chicken in the Nevada/Utah deployment areas. In Texas/New Mexico, impacts would be comparable to those addressed for Alternative 7 since the same lesser prairie chicken use areas are involved in both alternatives. One difference occurs in Roosevelt County where four fewer clusters are shown on the conceptual layout. Ths reduces long-term impacts in this county to moderate levels.

Waterfowl (1.3.2.5)

Significance of Resource and Impacts

Waterfowl are among the most valued wildlife resources in the United States, providing recreation for wildlife enthusiasts and sport and food for large numbers of duck hunters. The Texas/New Mexico High Plains playa lakes are wintering areas for over one million ducks and geese and provide resting places for a comparable number of waterfowl migrating on the Central Flyway. Loss of playa lakes would remove critical habitat for this nationally significant resource.

Waterfowl in the Nevada/Utah area, where they are a significant regional resource, are not expected to be significantly impacted by M-X. Abundance estimates of 50,000 or fewer in the DDA are lower than in the Texas/New Mexico

Table 1.3.2.4-1. Estimated DDA impact on Lesser Prairie Chicken in Texas and New Mexico, Alternative 7.

COUNTY	ABUNDANCE INDEX[1]	LONG-TERM IMPACT	
		PERCENT OF RANGE LOSS	LEVEL IMPACT
Counties with Clusters and DTN			
Bailey, TX	2	14	2
Castro, TX	1	0	1
Cochran, TX	2	1	2
Dallam, TX	1	0	1
Deaf Smith, TX	1	0	1
Hartley, TX	1	0	1
Hockley, TX	1	0	1
Lamb, TX	1	0	1
Oldham, TX	1	0	1
Parmer, TX	1	0	1
Randall, TX	1	0	1
Sherman, TX	1	0	1
Swisher, TX	1	0	1
Chaves, NM	2	1	2
Curry, NM	1	0	1
De Baca, NM	1	0	1
Guadalupe, NM	1	0	1
Harding, NM	1	0	1
Lea, NM	2	1	2
Quay, NM	1	0	1
Roosevelt, NM	3	2	3
Union, NM	1	0	1
DDA Overall Impact			1

4123

[1] 1 = No lesser prairie chickens present (abundance index), low impact (no lesser prairie chickens present)

2 = Lesser prairie chickens present (abundance index), moderate impact (range present but populations low)

3 = Key habitat present (abundance index), high (significant) impact (> 1 percent of area disturbed, breeding populations present)

area and are concentrated in national and state wildlife refuges in the White River System (Pahranagat National Wildlife Refuge, Key-Pittman and Wayne Kirsch Wildlife Management Areas), with larger numbers outside the DDA in Ruby Valley, Carson Sink, Overton, and Lahontan Valley. Major waterfowl habitats are considered geotechnically unsuitable. Where habitats, as broadly defined by state agencies (including seasonally marshy areas around playas), overlap project areas, the maximum proportion of habitat lost is 8 percent, and in most cases is 1 to 2 percent or less. Effects from water drawdown are difficult to evaluate but would probably not be significant for the larger habitats. Monitor Valley habitats are fed by mountain runoff. White River, Pahroc, and Pahranagat Valley habitats depend on springs, but in these valleys M-X water use is 10 percent or less of total perennial yield, so significant drawdown is unlikely. Smaller habitats, which might be affected by drawdown, support only small numbers of waterfowl. Indirect effects are also not likely to be significant, as waterfowl hunting is regulated by the states by bird population estimates, not hunter demand and the large waterfowl concentrations are in national and state refuges. Poaching is difficult to estimate, but effects probably would not be significant for the DDA.

Impact potential for Texas and New Mexico was evaluated using estimates of habitat abundance. Impact potential was considered low if habitat was not in the DDA portion of a county, moderate if habitat abundance was low in the DDA, and significant if habitat abundance was high in the DDA or project elements were adjacent to a refuge.

Proposed Action

No significant effects on waterfowl are expected for reasons given above.

Alternatives 1 through 6

No significant effects are expected for reasons given above.

Alternative 7

The high abundance of waterfowl in the Texas/New Mexico High Plains is due not only to the location on a major flyway, but to the large number of playa lakes which are concentrated in the central and western portions of the Texas Panhandle and easternmost part of New Mexico (Figure 1.3.2.5-1). Playa lakes are upland features scattered throughout the DDA, but tend to be concentrated in Hartley (eastern portion), Deaf Smith, Randall, Parmer, Castro, Bailey, and Lamb counties, Texas, where they number in the tend of thousands, providing resting and feeding areas for waterfowl. Of the four most abundant species, mallard, widgeon, green-winged teal, and pintail, green-winged teal require their food plants to be in water; the others can feed in grain fields and uplands as well (Bellrose, 1976).

DDA Impacts

There are two M-X-related actions which could adversely affect waterfowl and their essential habitat: construction of clusters and DTN, with ancillary effects; and population in-migration. Most of the playa lakes are intermittent and shallow, and the smaller ones are distributed ubiquitously, making avoidance difficult. It is expected that a number of smaller playa lakes will be lost due to

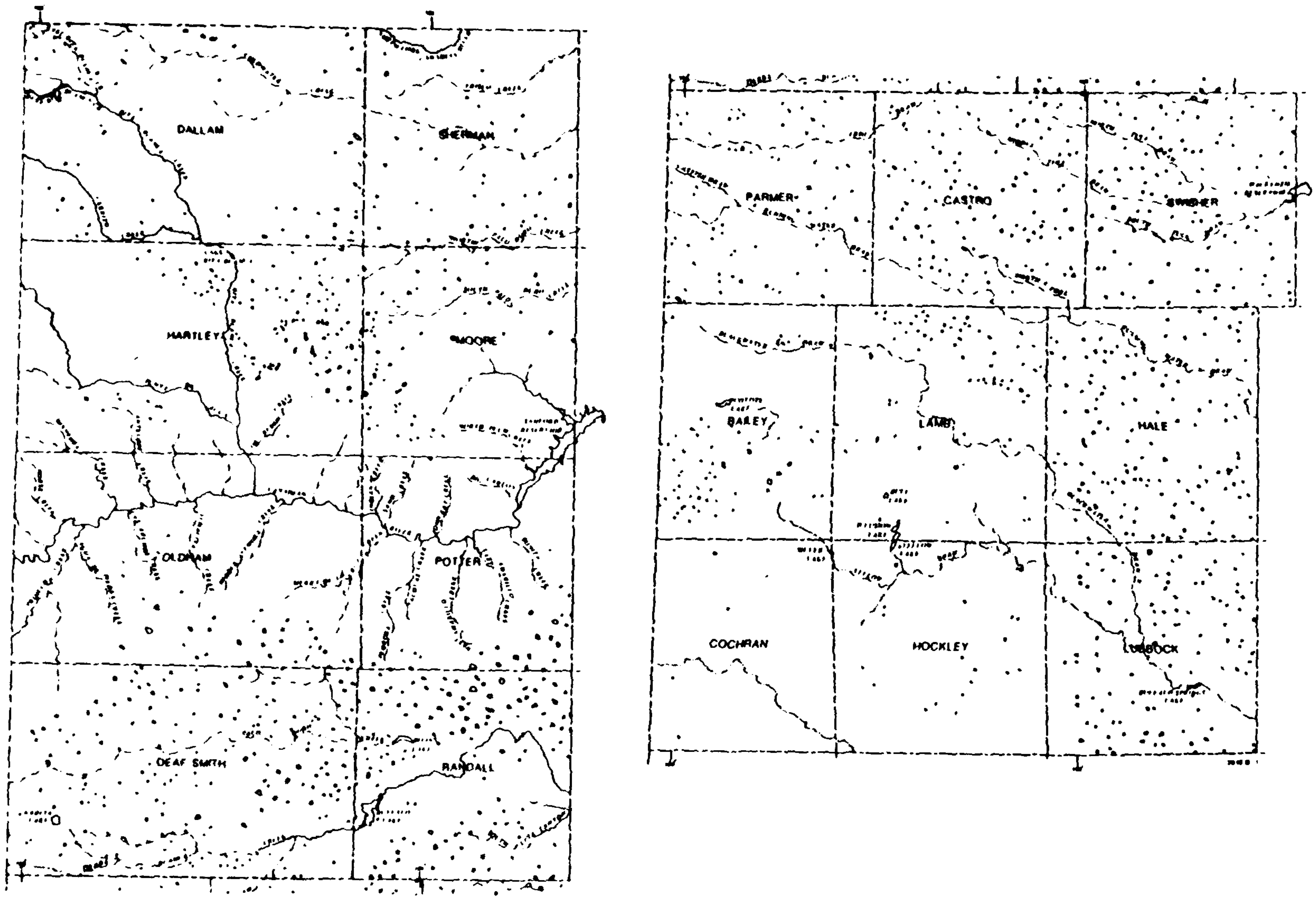


Figure 1.3.2.5-1. Distribution of the larger playa lakes in the Texas High Plains.

construction, but this cannot be determined before large-scale site layouts are available. Use of section roads for DTN and cluster roads, however, reduces the potential impact considerably below that expected if all roads were to be newly constructed. Because playa lakes are undrained internal catchment basins, spilled pollutants associated with construction, such as gasoline, oil, and cement dust, would enter the lakes and accumulate over the construction period, altering water chemistry and perhaps adding toxins adversely affecting invertebrates and plants used as waterfowl food. Noise from construction activites is likely to cause movement away from the immediate vicinity, but this disturbance should be minor, especially if there are other ponds nearby. the second M-X-related aciton is the influx of project-related personnel. The present scenario envisions construction camps providing both materials and housing in areas presently unoccupied, bringing people in constant contact with areas formerly disturbed only by agricultural practices. The major personnel-generated actions, hunting and disturbance due to ORVs and other recreational activities, are not likely to have a major effect, as waterfowl hunting is regulated and almost all the land where the playa lakes occur is privately owned. Thus, the major effects of M-X on waterfowl will be due to habitat removal by construction and potential irreversible pollution.

The overall effect would be at a maximum at the end of the construction period, when total land disturbed would peak. Thus, any loss of productivity should be manifest at this time. This loss will be long-term, as it is linked to irreversible habitat loss. No significant short-term effects are expected. Compared with existing conditions, the expected effect is a reduction in wintering waterfowl population size. The size of this, however, is problematical, due to lack of knowledge of the level of potential pollution from spilled construction and construction-related materials and its effect on a closed aquatic system. Data on food and space requirements of migrating and wintering waterfowl are lacking, virtually all research having been done on breeding grounds which are primarily in prairie potholes in the northcentral U.S. and Canada (Bellrose, 1976). Consequently, even if the area of habitat loss were known, the effect would still not be quantifiable. Table 1.3.2.5-1 presents habitat abundance and estimated impact levels.

Any irretrievable loss would be due to construction of M-X elements using part or all of playa lake basins, which is likely to be only a small percentage of the total playa lake area. As the present construction scenario envisions land disturbance at the minimum level, with use of section roads wherever possible, the actual loss due to disturbance would seem fixed. As concerns potential pollution, there are spill containment techniques to minimize movement of spilled materials. Pollutants would be most likely to affect the larger playa lakes, but system requirements call for these to be avoided, thus minimizing potential effects on waterfowl.

Operating Base Impacts

Operating Base at Clovis

As this area is already disturbed and has few playa lakes used by waterfowl, effects are expected to be minimal.

Table 1.3.2.5-1. Potential impact to waterfowl in Nevada/ Utah[1] and Texas/New Mexico DDAs for Alternatives 7 and 8.

COUNTY	ABUNDANCE INDEX[2]	ALTERNATIVE 7		ALTERNATIVE 8	
		SHORT-TERM IMPACTS[2,3]	LONG-TERM IMPACTS[2,3]	SHORT-TERM IMPACTS[2,3]	LONG-TERM IMPACTS[2,3]
Counties with M-X clusters and DTN					
Bailey, TX	3	3	3	NA[6]	NA
Castro, TX	2	3	3	NA	NA
Cochran, TX	1	1	1	1	1
Dallam, TX	2	2	2	1	1
Deaf Smith, TX[4]	2	3	3	2	2
Hartley, TX[4]	2	2	3	2	2
Hockley, TX	1	1	1	1	1
Lamb, TX	2	1	1	1	1
Oldham, TX	2	3	3	NA	NA
Parmer, TX	2	3	3	NA	NA
Randall, TX	3	3	3	NA	NA
Sherman, TX	2	1	1	NA	NA
Swisher, TX	ND[7]	ND	ND	ND	ND
Chaves, NM	2	2	2	2	2
Curry, NM[4]	2	2	2	1	1
DeBaca, NM	1	1	1	1	1
Guadalupe, NM	2	1	1	1	1
Harding, NM	1	1	1	1	1
Lea, NM	1	1	1	1	1
Quay, NM[5]	2	2	2	1	1
Roosevelt, NM[4,5]	3	3	3	3	3
Union, NM	1	1	1	1	1
Overall DDA Impact		2	2	1	1

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[1]No waterfowl habitat should be significantly affected as a result of M-X deployment in Nevada/Utah.

[2]Number on table: 1 = No/Low impact (no major habitat for Abundance Index.

2 = Moderate impact (wildlife refuge or numerous playa lakes present for Abundance Index).

3 = High impact (wildlife refuge and numerous playa lakes present for Abundance Index).

[3]Major waterfowl habitat are considered geotechnically unsuitable for M-X construction. However, a small amount of habitat could be lost due to land withdrawal and construction (roads, DTN, etc.). Indirect impacts resulting from increased population, changes in rainwater runoff patters, water draw-down, etc. would impact waterfowl use of existing habitat. Until more detailed studies (Tier 2) are conducted, potential impact is presented as a worst case.

[4]Candidate location of Area Support Center (ASC) for Alternative 7.

[5]Candidate location of ASC for Alternative 8.

[6]NA = Not applicable; contains no project elements.

[7]ND = No data available at this time.

Operating Base at Dalhart

As this area is already disturbed and has few playa lakes used by waterfowl, effects are expected to be minimal.

Alternative 8

Waterfowl abundance is low in the split-basing regions of both Nevada/Utah and Texas/New Mexico, so M-X-related effects will be minor. Appropriate habitat is rare throughout the Nevada/Utah region, and the portion of the Texas/New Mexico study area, primarily in New Mexico, used for project elements has few playa lakes compared with the full-basing DDA (Table 1.3.2.5-1).

GENERAL PROJECT EFFECTS ON WILDLIFE SPECIES (1.3.3)

The following sections discuss potential effects of project action on wildlife species in the Nevada/Utah and Texas/New Mexico study areas. The discussion for each study area begins with a discussion of direct and indirect project effects common to many species and is followed by a discussion of effects on selected species which concludes with evaluation of abundance of selected resources, their sensitivity to impact, and data quality for hydrologic subunits (Nevada/Utah) or counties (Texas/New Mexico) in the two study regions.

General Impacts - Nevada/Utah (1.3.3.1)

Effects Common to Many Species

Impacts involving all groups of wildlife are expected to occur due to the construction and operation of the M-X system in Nevada and Utah. These are summarized in Table 1.3.3.1-1.

Wildlife habitat loss will result from construction of protective structures, roads, construction camps, gravel pits, security facilities, and communication corridors. Around each protective structure about 7-8 acres of vegetation will be disturbed and about 1 acre of this amount will have vegetation permanently removed. Road building will remove additional vegetation and animal habitat in a band 100 ft (30 m) wide around the roadway.

For animals with larger home ranges (e.g., birds of prey, carnivores, ungulates) the actual habitat lost due to scarification is expected to be 1 to 2 percent or less per watershed. Thus, direct habitat loss should have minimal effects on their population numbers. During construction, however, behavioral avoidance of construction activity will significantly increase the amount of habitat lost. These behavioral responses, which will vary among species, will be discussed in greater detail in the next section.

Once construction activities have ceased, all but the permanently disturbed areas will be available for use by animals. The temporarily disturbed areas will revegetate, either naturally or through revegetation programs, changing the successional stage of the vegetation. Those species preferring disturbed areas are likely to predominate (e.g., jackrabbits, Vorhies and Taylor, 1933). In addition, changes in plant productivity and plant species composition along roadways could lead to an

Table 1.3.3.1-1. Summary of potential impacts to wildlife in the Nevada/Utah study area (page 1 of 8).

PROJECT PARAMETER	SECONDARY EFFECTS	POTENTIAL IMPACTS[1]			
		BIG GAME	REFERENCES	UPLAND GAME	REFERENCES
Area disturbed	Construction				
Protective structure = 10 ac/structure	Fugitive dust	No effects predicted.		No effects predicted	
4,600 structures, full basing	Erosion	Sedimentation of important water sources. Effect similar to these due to lowering of water table.	Prestegaard 1978.	Effects similar to those described for big game.	
2,300 structures, split basing roads = 100 ft wide 1,458-1,651 mi DTN, full basing 734 mi DTN, split basing 5,200-6,200 mi cluster roads, full basing 3,171 mi cluster roads, split basing	Loss of vegetation	Loss of habitat equal to disturbed area. About 1 percent of foraging range lost for lowland species. Little effect on populations.		Loss of habitat equal to disturbed area for valley species. Few negative effects on rabbit and quail populations. Loss of strutting grounds, brood use areas, and wintering grounds for sage grouse will reduce their numbers more than the loss of a similar acreage in other sage grouse habitat.	Wallestad, 1975; Peterson, 1970; Highby, 1969; Authenrieth, 1976; Klebenow, 1970.
Total = 117,657-127,452 ac, split basing (Total includes only protective structures, DTN and cluster roads)	Presence of machinery and people	All species will avoid construction activities. Pronghorn: Large overlap of range and suitable area for deployment. Mule deer: Small overlap between area suitable for deployment and winter and spring range. Roads may cross other habitats and migration routes. Bighorn sheep and elk: Roads through mountains may cross other habitats and migration routes.	Wehausen, 1979; Bellis and Graves, 1976; Hood and Inglis, 1974; McArthur et al, 1979.	Little or no avoidance of construction areas. Sage grouse, though, are likely to abandon strutting grounds.	
Concrete plant = 200 ac/plant		Little effect on mule deer, bighorn sheep, and elk.			
Marshalling years = 1,500 ac each		Displacement of pronghorn population and population reduction where key habitat is in vicinity of disturbance.			
	Operations				
	Fugitive dist	No effects predicted.		No effected predicted	
	Erosion	No effects predicted.		No effects predicted.	

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Table 1.3.3.1-1. Summary of potential impacts to wildlife in the Nevada/Utah study area (page 2 of 8).

PROJECT PARAMETER	SECONDARY EFFECTS	POTENTIAL IMPACTS			
		BIG GAME	REFERENCES	UPLAND GAME	REFERENCES
	Operations (Cont.)				
	Revegetation of disturbed areas	Areas not permanently disturbed or fenced may be used by big game. Use will depend upon rate of revegetation and species of plants.		Areas not permanently disturbed may be used by upland game species. Level of use will depend upon rate of revegetation and species composition of plants. Population recovery if disturbed areas become suitable for use.	
		Pronghorn: Species of plants will determine use.	Tsukamoto, 1979.		
		Mule deer: Increases in shrubs for browse along roads or in pinyon-juniper areas would be beneficial.	Carbough et al., 1975; Puglisi et al., 1974.		
		Bighorn sheep and elk: No effects.			
	Transmission lines	No effects predicted.		No effects predicted.	
Water Use					
Construction: full basing 22,275-25,316 ac ft/yr maximum 31,965-99,296 ac ft total	Lowering of water table	Pronghorn: Population reduction if water sources dry up. Necessary for water sources to exist every 1-5 mi (1.6 to 8 km).	Yoakum, 1978.	Population reduction if water sources dry up. Greatest reductions expected for quail, doves, and chukar.	Call, 1974; Maley, 1978.
Split basing 15,397 ac ft/yr maximum 41,550 ac ft total		Bighorn sheep: During summer, water holes are vitally important; however, these high altitude water sources are unlikely to be strongly affected.	McQuivey, 1978.		
(Direct use for concrete, dust suppression, workers only)		Elk: Their high altitude water sources are unlikely to be strongly affected.	Boyd, 1978.		
Vehicle Traffic	Fugitive dust	No effects predicted.		No effects predicted.	
Construction	Road kills	Increase in proportion to traffic volume; may impare reproduction more in small populations than large populations.	Schultz & Bailey, 1978; Allen & McCullough, 1976; McQuivey, 1978.	Increase in proportion to traffic volume.	
Operations: ASC to cluster = ~ 4,000 trips/yr	Noise and visual	Avoidance of areas near roads in proportion to traffic volume, resulting in habitat abandonment and disruption of migration routes.	Rost & Bailey, 1979; Schultz & Bailey, 1978; Lyon & Jensen, 1980; Bruns, 1977.	Little or no reduction in population size expected.	

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Table 1.3.3.1-1. Summary of potential impacts to wildlife in the Nevada/Utah study area (page 3 of 8).

PROJECT PARAMETER	SECONDARY EFFECTS	POTENTIAL IMPACTS[1]			
		BIG GAME	REFERENCES	UPLAND GAME	REFERENCES
	Noise and visual (Cont.)	Large negative effects on pronghorn if movement patterns are disrupted. Moderate negative effects on deer if migration routes are disrupted. Deer may habituate except in areas of heavy traffic. Few effects on elk and bighorn since little overlap of roads with habitat.			
Security	Radar and microwave emissions	Data insufficient to predict effects.		Data insufficient to predict effects.	
People	Sewage	Pollution of water sources may occur. Largest effect to pronghorn, which occur in valleys.		Treatment plans unknown; consequently effects are unknown. Ponds with treated sewage, if built, will attract doves and quail.	
	Solid waste	Minimal effects expected.		Predators attracted to disposal sites will eat upland game.	
Construction direct labor = 13,253-13,376/yr peak, full basing = 10,634/yr peak, split basing	Introduction of exotic species	Dogs running in packs may harass pronghorn and deer.	Boggess et al., 1978; Denny, 1974; McKnight, 1964.	Dogs and cats will harass and kill upland game species, particularly young. Predations most intense in and near settlements.	Denny, 1974; McKnight, 1964.
Induced growth = 34,000/yr peak, full basing Operations direct labor + induced growth = ~ 54,000 permanent residents	Recreation Off-road vehicles (ORV) use	Soil disturbance will change forage quality and quantity. All species will avoid ORV use areas.	Luckenback & Bury, 1978.	Changes in vegetation resulting from soil disturbance will cause population decline. Most species will avoid ORV use areas, and some will be run over by ORVs. Major reduction in sage grouse populations if ORVs use key habitat.	
During construction people will be dispersed throughout deployment area. During operation people and effects will be concentrated in the vicinity of operating bases.	Camping, hiking, etc.	Concentrated activities in big game habitat are likely to displace these animals. Recreation at water sites will reduce use by pronghorn and bighorn.	McQuivey, 1978; Jorgensen, 1974; Welles & Welles, 1961; Geist, 1971; Boyd, 1978.	Human use of watering areas will reduce use by all species.	

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Table 1.3.3.1-1. Summary of potential impacts to wildlife in the Nevada/Utah study area (page 4 of 8).

PROJECT PARAMETER	SECONDARY EFFECTS	POTENTIAL IMPACTS[1]			
		BIG GAME	REFERENCES	UPLAND GAME	REFERENCES
People (Cont.)	Recreation (Cont.)				
	Hunting	No effect on populations since no increase expected. Number of applicants for permits currently exceeds supply.		Increased hunting pressure proportional to increased number of people. May require changes in management policy such as reduced bag limits or seasons to maintain population levels.	
	Poaching	Potential for decrease in populations. Poaching may equal legal harvest. Deer will be most often poached because of their abundance. Small populations of bighorn and elk are likely to be exterminated if poaching is great.	Pursley, 1977.	Potential for population declines in upland game birds such as sage grouse, chukar, and quail.	

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Table 1.3.3.1-1. Summary of potential impacts to wildlife in the Nevada/Utah study area (page 5 of 8).

PROJECT PARAMETERS	SECONDARY EFFECTS	POTENTIAL IMPACTS:					
		FURBEARERS	REF.	WATERFOWL	REF.	COMMON/ TYPICAL	REFERNCES
Area disturbed	Construction						
	Fugitive dust	No effects predicted.		No effects predicted.		No effects predicted.	
	Erosion	Some population reduction if prey abundance declines.		Sedimentation in waterbodies could reduce the use of these areas by waterfowl by destroying vegetation or invertebrates which they eat. Additionally sediment accumulation could lead to reduction of surface area and degradation of habitat. Smaller areas may be completely Filled in.		For some animals, water sources could be destroyed due to siltation, population reduction of aquatic species and those which use aquatic vegetation likely.	
	Loss of vegetation	Loss of habitat equal to disturbed area. Little or no reduction in populations.		Loss of aquatic vegetation will reduce waterfowl numbers.		Loss of habitat equal to disturbed area. Habitat loss will result in partial or total loss of home range for some individuals, but overall population size will not be reduced greatly.	
	Presence of machinery and people	All species expected to avoid this activity. Coyote and kit fox range overlaps greatly with areas likely to have most activity, bobcat and gray fox overlap small; minimal effects on populations predicted. These animals will inhabit areas closer to construction sites than big game species.	Bekoff, 1977; McGrew, 1979.	Avoidance only if activities occur adjacent to water. No effects predicted if activity is greater than one mi from water areas containing waterfowl.		No effects on small animals such as reptiles and rodents. Some avoidance by larger animals such as birds and medium-sized mammals.	

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Table 1.3.3.1-1. Summary of potential impacts to wildlife in the Nevada/Utah study area (page 6 of 8).

PROJECT PARAMETERS	SECONDARY EFFECTS	POTENTIAL IMPACTS[1]					
		FURBEARERS	REF.	WATERFOWL	REF.	COMMON/ TYPICAL	REF.
Area disturbed (Cont.)	Operations						
	Fugitive dust	No effects predicted.		No effects predicted.		No effects predicted.	
	Erosion	No effects predicted.		No effects predicted.		No effects predicted.	
	Revegetation of disturbed area.	Effects will depend upon changes in prey abundance in disturbed areas-may increase or decrease. Total reduction in population size expected to be small but distribution may change somewhat.		No effects predicted.		Change in species composition as a result of altered successional stage.	Vorhies & Taylor, 1933; Cornett, 1980; Leedy, 1978.
	Transmission lines	No effects predicted.		Collisions with wires will occur with migrating birds or birds flushed from water. Population reduction expected to be low.	Kroodsma, 1978; Thompson, 1978.	Birds of prey, especially eagles, may be electrocuted on wires, but this occurs infrequently. Towers may be used for hunting perches and nesting.	Kroodsma, 1978; Stahlecker & Griese, 1979; Murphy, pers.comm., 1980.
Water Use	Lowering of water table	Effects may be small since these carnivores may be able to go without free water, deriving all the moisture they need from their prey. Reductions in populations will result if prey species abundances are reduced.	McGrew, 1979	Population decline if water bodies are eliminated. Smaller impact if larger water bodies are reduced in size; less waterfowl would be supported.		Reduction of population or displacement of animals needing drinking water. Predator populations reduced if prey populations are reduced due to the lowering of the water level. Little effect to all other species.	
Vehicle traffic	Fugitive dust	No effects predicted.		No effects predicted.		No effects predicted.	
	Road kills	Increase in proportion to traffic volume. Highway mortality is a significant source of death for kit fox.	Jensen, 1972; Morrel, 1972.	Increase in proportion to traffic volume. Little reduction in population size.		Increase in proportion to traffic volume.	Sargent & Forbes, 1973.

Table 1.3.3.1-1. Summary of potential impacts to wildlife in the Nevada/Utah study area (page 7 of 8).

PROJECT PARAMETERS	SECONDARY EFFECTS	POTENTIAL IMPACTS[1]					
		FURBEARERS	REFERENCES	WATERFOWL	REF.	COMMON/ TYPICAL	REFERENCES
Vehicle traffic (Cont.)	Noise and visual	Increase in traffic may locally affect these animals but most will habituate.		Initial disturbance expected to result in avoidance of roadways but species will habituate.		Only birds expected to be affected. Little or no reduction in population size.	
Security	Radar and microwave emissions	Data in-sufficient to predicted effects.		Data in-sufficient to predict-ed effects.		Data in-sufficient to predicted effects.	
People	Sewage	No impacts expected unless prey items are affected by pollution of water sources.		Lagooning of waste-water will provide resting sites. Water quality will deter-mine use of these areas.		New water sources will provide habitat for aquatic species of those dependent on water or water-related vegetation.	
	Solid waste	Some species, such as skunks, racoons, coyotes, and fox will be attracted to disposal sites.		If disposal sites are near water bodies water quality may be degraded. Predators will also be attract-ed. This will lead to a reduction in popula-tion size.		Some species will be attracted to disposal sites such as rats, ravens, gulls, house mice, and some types of snakes. Those attracted may replace or displace native species in vicinity of sites.	Deboer et al 1975. Davidson, et al., 1971.
	Introduction of exotic species	Dogs and cats will harass and kill some fur-bearers. These animals will also reduce prey abundance for furbearers near settlements.	Denny, 1974	Dogs will harass and kill water-fowl.	Denny, 1974	Dogs and cats will harass and kill some species; other exotic species (e.g. sparrows and starlings) associated with community development will dis-place some species.	McNight, 1964; Emlen, 1974. Christian, 1974.
	Recreation						
	ORV use	Change in vegetation resulting from soil disturbance will affect furbearers through loss	Lucken-back and Bury, 1978; Morrell, 1972; Jensen, 1972	ORV use at water areas such as springs and ponds will degrade quality of areas for waterfowl.		Changes in vegetation resulting from soil disturbance will cause loss of cover and food. Noise	Bury et al. 1977. Byrne, 1973. Luckenback, 1978. Brattstrom and Bondello,

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Table 1.3.3.1-1. Summary of potential impacts to wildlife in the Nevada/Utah study area (page 8 of 8).

PROJECT PARAMETERS	SECONDARY EFFECTS	POTENTIAL IMPACTS[1]					
		FURBEARERS	REFERENCES	WATERFOWL	REF	COMMON/TYPICAL	REFERENCES
People (Cont.)	Recreation ORV use (Cont.)	of cover or prey items. Many species will avoid ORV use areas; and some will be run over by ORVs. ORV use will significantly reduce kit fox numbers.				will cause avoidance by some species and loss of hearing will increase suscepta-bility to predation. Premature emergence of spadefoot toads, lead-ing to death, has occurred due to ORV noise. Some species will be run over.	1980.
During con-struction, people will be dispersed throughout deployment area.	Camping, hiking, etc.	Intensive activity will cause animals to avoid the area.	Egoscue, 1956 and 1962.	Human use of water bodies will reduce use by water-fowl.		Little effects expected.	
During opera-tions, people and effects will be concentrated in the vicinity of operating bases.	Hunting	Increased hunting pressure proportional to number of people. May require changes in management policy such as reduced bag limits or seasons to maintain population levels.		Increased hunting pressure proportion-al to number of people. May require changes in management policy such as reduced bag limits or seasons to maintain population levels.		Only jack-rabbits are likely to be hunted, reducing populations slightly.	
	Poaching	Poaching likely for most species. Little re-duction of overall population. Decline in Coyote populations may be per-ceived as beneficial.		Waterfowl expected to be poached; however, most areas with abundant waterfowl populations are in National Wildlife Refuges and access is regulated.		Many species may be poached, particularly during construction. Effects on populations expected to be small.	

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[1]Data insufficient to predict impacts means that data are lacking for one or more of the following: specific project information (e.g., well locations and drawdown of springs), sensitivity of resource to project-caised perturbations, and resource abundance and distribution in the study area.

increase in herbivore abundance and diversity (Cornett, 1980; Leedy, 1978). In turn, it is possible that carnivores might benefit from the higher concentrations of their prey.

The large water requirements of this project, taken from groundwater sources, could reduce the surface area and volume of important surfacewater features, including springs, streams, and ponds. (Data presently available are insufficient to predict water drawdown in specific localities.) Since many species of animals depend upon these sources for shelter and drinking water, reduction in water levels could result in habitat loss. In addition, water table drawdown could reduce emergent aquatic and riparian vegetation which provides habitats for some species, particularly songbirds. Animals that live in or near water and are dependent upon it for all or part of their life cycle would suffer population declines as a result of habitat reduction or loss. These species include amphibians, waterfowl, shore birds, muskrat, and beaver.

The large amounts of traffic necessary to transport construction materials, workers, equipment, and supplies and wastes for construction camps could impact wildlife, as summarized in Table 1.3.3.1-1. Noises from these vehicles could seriously affect animals found close to roads. Brattstrom and Bondello (1980) found that after 8 minutes of 90 db (equivalent to an ORV at 50 yards) fringe-toed lizards (Uma sp.) lost their hearing for up to two to three months. At the same noise level, Merriam's kangaroo rats (Dipodomys merriami) were significantly more vulnerable to rattlesnakes due to a reduction in hearing capabilities. They also found that western spadefoot toads (Scaphiopus hammondi) emerged from their burrows in response to 20 minutes of recorded motorcycle noise. Spadefoot toads normally respond to thunder in this manner and then proceed to mate and lay eggs in the temporary pools formed by thunderstorms. Noise at times other than when rain occurs could lead to emergence and increased mortality in the heat and dryness of summer. Larger animals such as ungulates, carnivores, and birds of prey may also be adversely affected by noise and the visual disturbance associated with traffic. These disturbances result in avoidance of roads and, therefore, loss of habitat near roads (Rost and Bailey, 1979; Basile and Lonner, 1979). More discussion on individual species can be found in the following section.

Increases in vehicle traffic on roads will lead to an increase in highway kills of many kinds of animals (Schultz and Bailey, 1978; Allen and McCullough, 1976). Rodents, reptiles, low-flying birds (e.g., horned larks), deer, bighorn sheep, elk, and nocturnal animals including owls, skunks, and rabbits will be especially vulnerable (McQuivey, 1978; Jense and Burruss, 1979; Sargent and Forbes, 1973). During construction, effects on small animal population are predicted to occur near roads throughout the study area. These impacts are expected to be short-term; project-related traffic effects on small animals during operations are expected to be negligible. For the big game animals, road kill effects are discussed in the following section.

Few new transmission lines are planned to be built for this project because the existing power transmission grid may be used in part for the power needs of M-X. New electric power transmission lines are not expected to impact most wildlife species but may be a hazard to flying birds. Collisions are especially likely for waterfowl when taking off from ponds if lines are close by (Kroodsma, 1978), and for migrating birds when visibility is restricted (Thompson, 1978). Birds of prey, such as

eagles, have been electrocuted by smaller transmission lines with short distances between individual lines. However, this is not likely to be a problem with high voltage transmission lines because the individual lines are farther apart (Kroodsma, 1978). Beneficial effects of transmission lines and power poles include their use by some birds of prey for nesting (Stahlecker and Griese, 1979) and as hunting perches (Murphy, pers. comm., 1980).

Radar and microwave emissions produced by surveillance and communications equipment pose potential hazards to wildlife (Tyler, 1973; Steneck, et. al., 1980). Data are currently insufficient to quantify these effects.

Indirect effects of the project, which result from population growth associated with the project, are expected to be as large or larger than the direct effects of construction and operation. Population growth induced by the project will lead to urbanization in some areas (particularly near OBs), and increased visitation to formerly remote and sparsely settled regions. Urbanization will usually concentrate in valley bottoms near water. Wetland areas contain important habitats for wildlife and have a high potential for degradation or destruction. Water requirements of these people will require pumping of groundwater which will have the same kinds of effects described earlier in this section.

Urbanization will result in the production of solid and liquid wastes which will need to be disposed of or treated. The impacts of liquid waste production cannot be determined until waste disposal methods are defined. Solid wastes normally are taken to landfills, which should attract animals such as gulls, ravens, magpies, skunks, raccoons, house mice, rats, and certain kinds of snakes (Davidson, et al., 1971; DeBoer et al., 1975). Certain of these species increase the likelihood of disease transmission, and the exotic (non-native) species may displace native species in adjacent areas.

In residential areas native vegetation could be displaced by ornamental and non-native species which often attract non-native animals (house sparrows and starlings) (Emlen, 1974). The concentrations of people and attendant noise, activity and deliberate disturbance to animals will cause many native species to leave or be eliminated from these areas. For instance, animals intolerant of such disturbances include secretive predators (e.g., owls, bobcats, foxes, and badgers) and ungulates (e.g., pronghorn and elk), all of which have declined in the vicinity of housing centers. Coyotes, however, are commonly found in areas of human activity (Bekoff, 1977). In areas near OBs and at construction camp sites, non-native animals, such as dogs and cats, may be brought in with people, and these introduced species often kill or harass native animals (Boggess et al., 1978; Christian, 1974; Denny, 1974; and McNight, 1964).

A second major indirect effect stems from increased visitation to formerly remote and sparsely settled areas. The large work force (expected to be about 30,000 persons during peak years) necessary for constructing and operating the M-X facilities will be dispersed over the deployment area in 19 construction camps. When not working, these people will recreate in the area surrounding the particular valley where they are stationed. The operations personnel and attendant support community will be concentrated at and near the two operating bases. These people will also recreate in nearby areas, probably within 70 mi (112 km) of the bases. The recreation activity most likely to adversely affect wildlife is ORV use, although

hiking and camping may have localized effects in heavily used areas. These activities may occur in the valleys, but most are expected to be concentrated in nearby mountain and riparian areas. The areas most suitable for recreation are also the most likely to contain high concentrations of wildlife.

ORV use is expected to be high among construction workers and to a lesser extent for operations and support people. Because of expansion of road systems, access to formerly remote areas will be facilitated by construction activities. ORV use will adversely affect wildlife through loss of vegetation, noise, soil disturbance, and direct mortality. For example, Bury et al., (1977) found a significant decrease in reptile and rodent species, individuals within species, and biomass in areas used by ORVs; numbers of individuals decreased 45 and 80 percent, and biomass decreased 77 and 83 percent, respectively, in heavily used and pit areas. They also found a decrease in avifauna during a breeding-bird survey. Their data suggest that wildlife populations were disrupted over a wide area. Furthermore, ORV-disturbed areas in the western Mojave Desert supported lower rodent densities and diversity than similar, undisturbed areas (Byrne, 1973). Moderate ORV use resulted in a 50 percent decline in the numbers of species of breeding birds in the Mojave Desert (Luckenback, 1978). The number of breeding pairs and average biomass decreased 24 and 22 percent, respectively and a 90 percent reduction of breeding bird species occurred in an impacted wash (Luckenback, 1978).

Hunting should have little or no adverse effect on big game animal populations. For these species, the number of permits issued each year currently does not meet the demand. Thus, unless management policies are changed, an increase in demand should not change hunting pressure. However, hunting pressure on other game species should increase in proportion to the increase in the number of people present. In addition, poaching is likely to be a severe problem in most areas, unless controlled. In New Mexico, for example, big game poaching may be as large or greater than the legal harvest (Pursley, 1977). Deer and game birds are the animals most likely to be shot since they are generally the most abundant game animals in the study area.

Effects on Selected Species

An important group of animals likely to be affected by the project are the birds of prey. Important species in the M-X region include golden eagle, ferruginous hawk, red-tailed hawk, Swainson's hawk, rough-legged hawk, marsh hawk, prairie falcon, kestrel, Cooper's hawk, turkey vulture, long-eared owl, great horned owl, and burrowing owl. Because many of these birds are large, conspicuous, roadside animals, they are preferred targets for poachers. They are also subject to harassment at their nests and to being killed by cars. Certain species are expected to be highly sensitive to the project because they nest in the lowland Great Basin in precisely those areas where M-X may be deployed. These species include the ferruginous hawk and burrowing owl. Both species have declined in numbers in recent years because of human activities. Impacts of the M-X project on birds of prey is the subject of an ongoing study.

Two species of endemic rodents, the pale kangaroo mouse (*Microdipodops pallidus*) and dark kangaroo mouse (*M. megacephelus*) may be affected by this project because a large part of their range is contained in those lowland portions of the great basin (Hall and Kelson, 1959) considered suitable for M-X deployment.

Unlike these two mice, other terrestrial wildlife species in the project area have populations both inside and outside the great basin: M-X project effects on them will leave large parts of their populations untouched.

Big game animals that may be affected by M-X deployment in Nevada/Utah include pronghorn, mule deer, bighorn sheep, and elk. Of these species, pronghorn are most likely to be impacted because larger proportions of their range coincide with areas suitable for M-X deployment than for the other big game species. Construction activities in those watersheds containing pronghorn (high and intermediate abundance ratings in Figure 1.3.3.1-1) would result in at least a temporary habitat loss through vegetation removal and their avoidance of human activity. The effects of displacing pronghorn from a portion of their range will be site-specific. Displacement of pronghorn from this area for the duration of construction (1-2 years) would reduce reproductive success of a herd(s) inhabiting this portion of its range through loss of forage, water, and fawning areas. Use of marginal areas by the displaced animals could result in death from lack of water or starvation (Martin, 1970; Hailey, et al., 1966; Beale and Smith, 1970), particularly since much of the study area is overgrazed (Hinman, 1959 and 1961; Leopold, 1959; Tsukamoto, 1979).

During the operational phase of the project, most of the habitat excluded from use during construction will again be available. For instance, the areas paved or fenced (around protective structures) will not be available, but the areas from which vegetation was removed or destroyed will become suitable as revegetation occurs. Whether these areas will provide forage suitable for pronghorn is unknown at present, since natural revegetation of soils disturbed for vegetation modification in Nevada did not result in plants suitable for pronghorn (Tsukamoto, 1979). It is also questionable whether pronghorn will recolonize areas once vacated A carefully designed revegetation program, however, could produce desirable forage, if behavioral avoidance does not preclude use of the area. The effects of project roads, protective structures, fences, towers, and security facilities on pronghorn use of the interspersed habitat are difficult to predict at this time, as they depend on behavioral responses to unprecedented pattern of development. Roads, however, are known to affect pronghorn movement patterns, even if they are not fenced. In Montana, although pronghorn occur within 0.3 mi (0.5 km) of highways, they cross the roads only rarely (Bruns, 1977), possibly as the result of traffic (0 to 6 vehicles per day). If any of these project elements act as barriers, carrying capacity of the range may be reduced.

Seasonal seeps and permanent springs are important water sources for pronghorn in all but the northernmost part of Nevada; playas also provide water and forage (Tsukamoto, 1979). Flow in springs and seeps within the cone of depression around wells used to supply water for the project may be reduced or eliminated. The likelihood of this happening will depend upon the number and spacing of wells in addition to aquifer properties in each watershed. Since pronghorn require water at 1 to 5 mi (1.6 to 8.0 km) intervals (Yoakum, 1978), portions of their range may become unusable for lack of water. Loss of water sources in the center of a valley, such as Spring Valley would then preclude access to other parts of the valley. Alteration of drainage patterns that would affect runoff to playas could have similar effects on pronghorns. Impacts resulting from water use would occur throughout the deployment area during construction and in the vicinity of the operating bases during operations. Since pronghorn range is in the lowland areas suitable for project deployment, at least some of the roads used for the project will be within their

WATERSHEDS IN THE NEVADA/UTAH STUDY AREA

LEGEND

2 PILOT
4 SNAKE
5 PINE
6 WHITE
7 FISH SPRINGS
8 DUGWAY
9 GOVERNMENT CREEK
10 SKULL
11 [illegible]
12 TOOELE
13 RUSH
14 CEDAR
16 GOSHEN
17 PILGRIM FLAT
18 PAINTED FLAT
19 NORTHERN SALT LAKE
20 [illegible]
20 JORDAN
21 SMOKE CREEK DESERT
22 SAN EMIDIO DESERT
23 GRANITE BASIN
24 HUALAPAI FLAT
25 MUD MEADOW
28 BLACK ROCK DESERT
31 DESERT
32A GREAT SALT LAKE DESERT LAKE
32B GREAT SALT LAKE DESERT WESTERN DESERT
43 STARR
44 NORTH FORK
45 LAMOILLE
46 SEVIER DESERT UT
46A SEVIER DESERT DRY LAKE UT
46 SOUTH FORK
47 HUNTINGTON
48 BEAVER UT
48 DIXIE CREEK TENMILE CREEK
49 PAROWAN UT
49 ELKO SEGMENT
50 MILFORD UT
50 SUSIE CREEK
51 MAGGIE CREEK
51 CEDAR CITY UT
52 MARYS CREEK
52 LUND DISTRICT UT
53 BERYL ENTERPRISE DISTRICT UT
53 PINE
54 WAH WAH UT
54 CRESCENT
55 CARICO LAKE
56 UPPER REESE RIVER
57 ANTELOPE
58 MIDDLE REESE RIVER
59 LOWER REESE RIVER
60 WHIRLWIND
61 BOULDER FLAT
62 ROCK CREEK
64 CLOVERS
65 PUMPERNICKEL
70 WINNEMUCCA SEGMENT
71 GRASS
72 IMLAY
73 LOVELOCK
73A LOVELOCK OREANA
74 WHITE PLAINS
75 BRADYS HOT SPRINGS
76 FERNLEY
77 FIREBALL
78 GRANITE SPRINGS
79 KUMIVA
80 WINNEMUCCA LAKE
81 PYRAMID LAKE
82 DODGE FLAT
83 TRACY SEGMENT
84 WARM SPRINGS
85 SPANISH SPRINGS
86 SUN
87 TRUCKEE MEADOWS
88 PLEASANT
89 WASHOE
90 LAKE TAHOE BASIN
91 TRUCKEE CANYON SEGMENT

92A LEMMON WESTERN
92B LEMMON EASTERN
93 ANTELOPE
94 BEDELL FLAT
95 DRY
96 NEWCOMB LAKE
97 HONEY LAKE
98 SKEDADDLE CREEK
99 RED ROCK
100 COLD SPRING
101 CARSON DESERT
101A CARSON DESERT PACKARD
102 CHURCHILL
103 DAYTON
104 EAGLE
105 CARSON
106 ANTELOPE
107 SMITH
108 MASON
109 EAST WALKER
110A WALKER LAKE SCHURZ
110B WALKER LAKE LAKE
110C WALKER LAKE WHISKEY FLAT HAWTHORNE
111A ALKALI MINERAL NORTHERN
111B ALKALI MINERAL SOUTHERN
112 MONO
113 HUNTOON
114 TEELS MARSH
117 FISH LAKE
118 COLUMBUS SALT MARSH
119 RHODES SALT MARSH
120 GARFIELD FLAT
121A SODA SPRING EASTERN
121B SODA SPRING WESTERN
122 GABBS
123 RAWHIDE FLATS
124 FAIRVIEW
125 STINGAREE
126 COWKICK
127 EASTGATE
128 DIXIE
129 BUENA VISTA
130 PLEASANT
131 BUFFALO
132 JERSEY
133 EDWARDS CREEK
136 MONTE CRISTO
137A BIG SMOKY TONOPAH FLAT
137B BIG SMOKY NORTH
138 GRASS
139 KOBEH
140A MONITOR NORTHERN
140B MONITOR SOUTHERN
141 RALSTON
142 ALKALI SPRING
143 CLAYTON
144 LIDA
145 STONEWALL FLAT
146 SCAROBATUS FLAT
147 GOLD FLAT
148 CACTUS FLAT
149 STONE CABIN
150 LITTLE FISH LAKE
151 ANTELOPE
152 STEVENS
153 DIAMOND
154 NEWARK
155A LITTLE SMOKY NORTHERN
155B LITTLE SMOKY CENTRAL
155C LITTLE SMOKY SOUTHERN
156 HOT CREEK
157 KAWICH
158A EMIGRANT GROOM LAKE
158B EMIGRANT PAPOOSE LAKE
159 YUCCA FLAT
160 FRENCHMAN FLAT
161 INDIAN SPRINGS
162 PAHRUMP
163 MESQUITE
168 THREE LAKES

169A TIKAPOO TIKABOO NORTHERN
169B TIKAPOO TIKABOO SOUTHERN
170 PENOYER
171 COAL
172 GARDEN
173A RAILROAD SOUTHERN
173B RAILROAD NORTHERN
174 JAKES
175 LONG
176 RUBY
177 CLOVER
178A BUTTE NORTH
178B BUTTE SOUTH
179 STEPTOE
180 CAVE
181 DRY LAKE
182 DELAMAR
183 LAKE
184 SPRING
185 TIPPETT
186A ANTELOPE [illegible] SOUTHERN
186B ANTELOPE [illegible] NORTHERN
187 GOSHUTE
188 INDEPENDENCE
191 PILOT CREEK
194 PLEASANT
195 HAMLIN
198 DRY
199 ROSE
200 EAGLE
201 SPRING
202 PATTERSON
203 PANACA
204 CLOVER
205 MEADOW WASH
206 KANE SPRINGS
207 WHITE RIVER
208 PAHROC
209 PAHRANAGAT
210 COYOTE SPRINGS
211 THREE LAKES
212 LAS VEGAS
215 BLACK MOUNTAINS
216 GARNET
217 HIDDEN NORTH
218 CALIFORNIA WASH
219 MUDDY RIVER SPRINGS
220 LOWER MOAPA
221 TULE DESERT
222 VIRGIN RIVER
223 GOLD BUTTE
224 GREASEWOOD BASIN
225 MERCURY
226 ROCK
227A FORTYMILE CANYON JACKASS FLATS
227B FORTYMILE CANYON BUCKBOARD MESA
228 OASIS
229 CRATER FLAT
230 AMARGOSA DESERT
231 GRAPEVINE CANYON
232 ORIENTAL WASH

1690-B

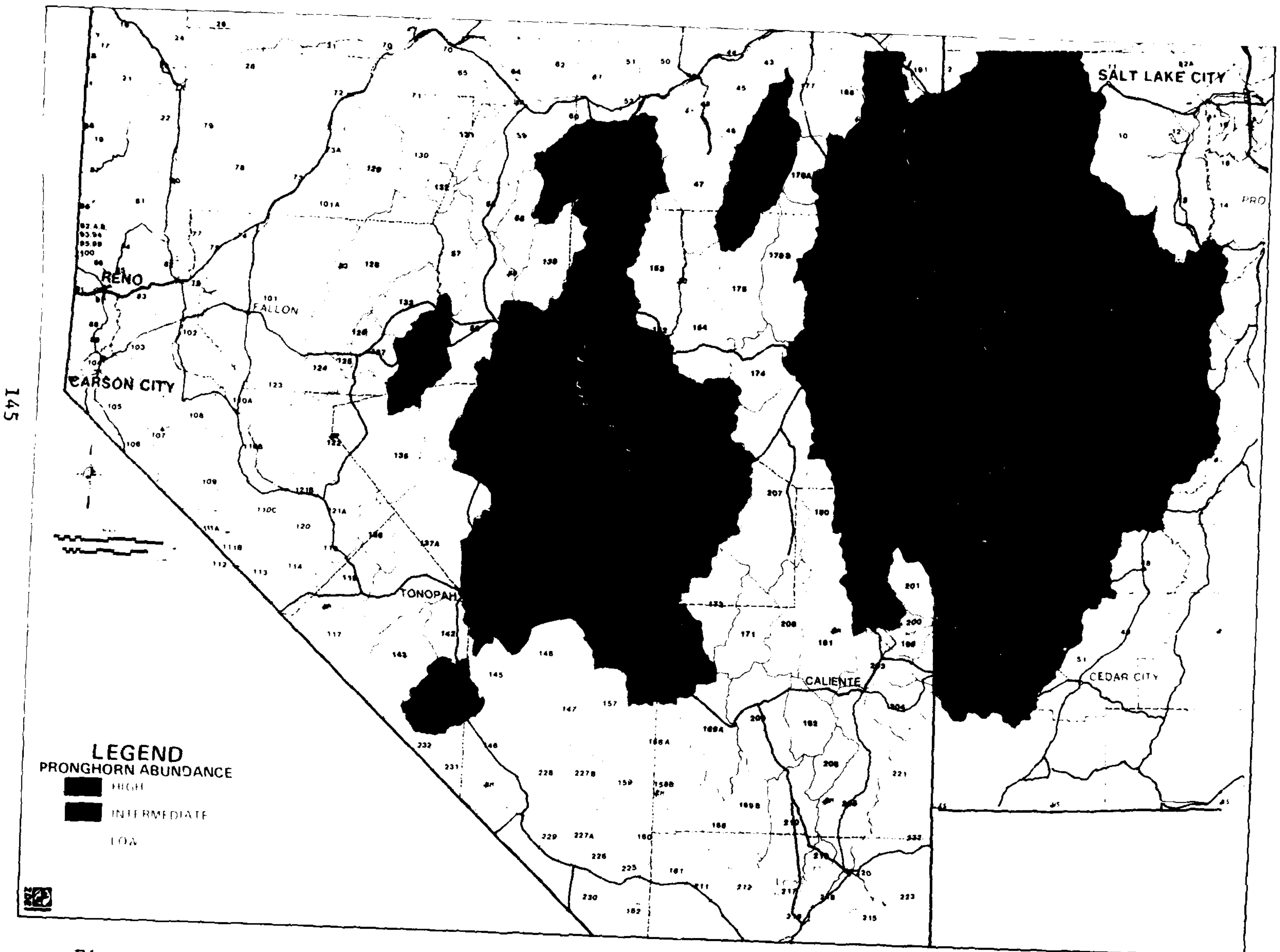

Figure 1.3.3.1-1. Pronghorn abundance ranking for hydrologic subunits in Nevada/Utah.

habitat. Frequency of road kills is expected to be low, however, because these areas are open with few visual obstructions, and pronghorn are very wary of vehicles. Evaluation of project alternatives and further analysis of impacts to pronghorn is presented in the principal impacts section above.

Construction activities could impact mule deer through loss of lower elevation winter and spring range, both of which contain areas of key habitat, in some valleys. Winter key habitat areas are of vital importance to mule deer since they provide forage and shelter when high elevation habitats are unavailable due to heavy snow. Without these areas, deer would incur energetic stresses and suffer increased winter mortality. Spring key habitat areas provide forage for the winter-weakened animals in addition to areas where does give birth to their fawns. The amount of key habitat present in the potential deployment area by hydrologic subunit and estimated amount disturbed during construction are presented in Appendix 1.6.2. Key habitat would generally be less than 1 percent of the total in each subunit.

Another potential impact to mule deer would be through interruption of migration pathways between seasonal ranges, which would effectively reduce available habitat, some of which may be key habitat. The M-X road network would cross at least some of these pathways, particularly on bajadas and in mountains. Other project features may interfere with migration routes that cross valleys. During construction of facilities in or across a migration route, deer movements may be interrupted by avoidance of the activity (e.g., Bellis and Graves, 1976; Hood and Inglis, 1974). This effect should be short-term (no more than 2 years); after that time they would be able to use the route again (assuming no permanent barrier, such as a fence, were constructed).

Other effects of roads on mule deer are related to traffic and altered vegetation along roadsides. If deer avoid roads and traffic, then habitat is lost; if they do not show such avoidance behaviors, then road kills are increased. Noise and visual disturbances have been shown to reduce deer use of habitat adjacent to roads, particularly within 650 feet (200 m) (Rost and Bailey, 1979; Bellis and Graves, 1976). In contrast, where runoff increases forage productivity in areas adjacent to roads, deer may be attracted to these areas (Carbough et al., 1975; Puglisi et al., 1974). Increased traffic during construction is expected to affect deer throughout the area wherever roads intersect their range. For operations, this kind of effect would occur primarily in the vicinity of the OBs.

Traffic resulting from construction and operations activities, and from travel by support community people would also lead to increased mortality of deer on roads (e.g., Allen and McCullough, 1976). In Utah, annual highway mortality of deer averaged 1,400 statewide for the period 1971 through 1978 (Jense and Burruss, 1979). This amounts to approximately 2 percent of the regular licensed harvest during that same period. For the management units in the Utah portion of the study area, the mean number of road kills per year by management unit ranged from 0 to 35, and averaged 11 (Table 1.3.3.1-2). A comparison of road kill data with seasonal distribution (Utah DWR, unpublished data), harvest data (indication of abundance), and 1978 traffic data (Utah DOT, 1979) indicates that the number of road kills is related primarily to roads (other than interstate highways which are fenced) that pass through winter range and have intermediate amounts of traffic. That is, they pass through winter concentration areas or cross migration routes. Road kills are greater in the mountains to the east and south of the study area than in the study

Table 1.3.3.1-2. Comparison of reported mule deer road kills and harvest data for western Utah.

MANAGEMENT UNIT	1978 HARVEST	ANNUAL ROAD KILLS (1971-78 MEAN)	ROAD KILLS AS PERCENT HARVEST
11*	1,655	20	1.2
12*	985	2	0.2
13*	827	1	0.1
14*	388	9	2.3
41	2,210	16	0.7
42	1,519	78	5.1
49	168	79	47.0
53*	293	9	3.1
54*	566	23	4.1
55*	1,006	35	3.5
56A*	303	21	6.9
56B*	142	27	19.0
56C*	368	3	0.8
57A	262	18	6.9
57B	419	52	12.4
58	197	38	19.3
59	84	24	26.6
61A	283	12	4.2
61B	304	5	1.7
61C	450	2	0.4
62A	152	<1	0.2
62B	86	0	0
62C	118	0	0

3674

*Management units which are completely or partially in the watersheds considered for the study area.

Source: Janse and Burruss, 1979.

area, as deer populations are sparse in the study area and traffic currently is low. An increase in traffic during construction would be expected to proportionally increase road kills. The absolute number of deer killed cannot be predicted. Increased traffic in the mountain areas on the periphery of the project area resulting from induced population growth could kill more deer than construction-related road kills in the deployment area; more deer are present in these mountain areas, and roads intersect more deer range and migration routes. The amount and location of this expected traffic has not been calculated at this time.

Bighorn sheep and elk are less likely to be affected directly by the project because they live in mountains. However, construction and operation of roads and communication systems in the mountains may affect them through habitat loss or disturbance. Elk have been shown to avoid roads for a distance of about 650 ft (200 m), and avoidance is related to volume of traffic (Rost and Bailey, 1979; Lyon and Jensen, 1980; Schultz and Bailey, 1978). Such effects are particularly strong where off-road activities (particularly hunting) occur (Schultz and Bailey, 1978). The effect of any such habitat loss on elk populations resulting from M-X activities would be difficult to quantify.

Road kills of elk and bighorn sheep resulting from collisions with construction-related vehicles are expected to be much lower than for deer since these species have much lower abundances in the study area and roads (existing and new project roads) intersect less of their habitat. No data are available to assess present road kills for these species or to quantify project effects.

Recreation at water holes used by bighorn will keep these animals away from these water sources (McQuivey, 1978; Jorgensen, 1974; Welles and Welles, 1961; Geist, 1971). The exclusion of bighorn from these sites is possible, as recreation is likely to concentrate in places with surface water. A more detailed analysis of potential impacts and evaluation of project alternatives with respect to bighorn sheep is presented in the preceding section (Principal Impacts). Where alternative water sources are unavailable, bighorn sheep populations would be severely reduced (Welles and Welles, 1961). Even where water is available, restriction of animals to less favorable habitat will have similar detrimental effects. For elk, recreational uses such as camping and backpacking in summer ranges may cause movement to less favorable habitats (Boyd, 1978), thus increasing mortality. The potential for such effects on elk will depend primarily upon the location of the main operating bases, as elk are found in only a few locations within the potential deployment area in Nevada and Utah (see Section 3.1.6 for locations). An example of one potential base location and big game range is shown in Figure 1.3.3.1-2.

Of the upland game birds in the study area, the sage grouse is the species most likely to be affected directly by construction and operation. The other species generally do not frequent valleys, except for Gambel's quail and chukar partridge in winter. Construction activities could impact sage grouse through habitat loss and disturbances which disrupt reproductive activities in these watersheds where they occur (Figure 1.3.3.1-3, high and intermediate abundance categories). Loss of some general habitat to roads and shelters is expected to have minimal effect on population size, since their range is currently divided by agriculture and transportation corridors with no apparent adverse effects. Loss of key habitat such as strutting grounds, brood use areas, and wintering grounds, however, could reduce populations by a factor larger than the actual area lost. Strutting grounds are

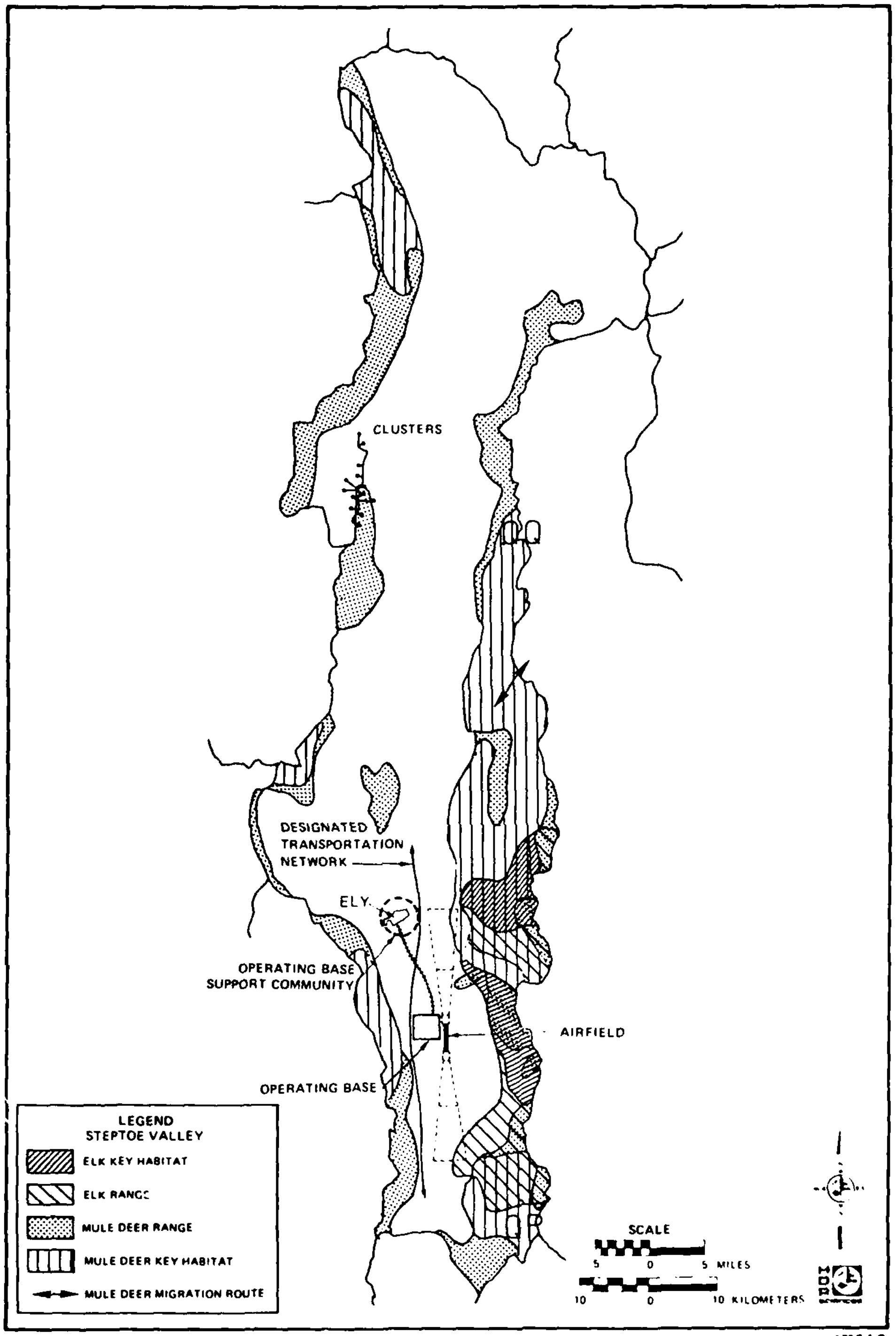

Figure 1.3.3.1-2. Conceptual layout of an operating base near Ely in Steptoe Valley showing elk and mule deer ranges.

WATERSHEDS IN THE NEVADA/UTAH STUDY AREA

LEGEND

2	PILOT
4	SNAKE
5	PINE
6	WHITE
7	FISH SPRINGS
8	DUGWAY
9	GOVERNMENT CREEK
10	SKULL
11	SINK
12	TOOELE
13	RUSH
14	CEDAR
16	GOSHEN
17	PILGRIM FLAT
18	PAINTER FLAT
18	NORTHERN UTAH LAKE (UT)
19	DRY
19	JORDAN (UT)
21	SMOKE CREEK DESERT
22	SAN EMIDIO DESERT
23	GRANITE BASIN
24	HUALAPAI FLAT
26	MUD MEADOW
28	BLACK ROCK DESERT
31	DESERT
32A	GREAT SALT LAKE DESERT LAKE
32B	GREAT SALT LAKE DESERT WESTERN DESERT
43	STARR
44	NORTH FORK
45	LAMOILLE
46	SEVIER DESERT (UT)
46A	SEVIER DESERT DRY LAKE (UT)
46	SOUTH FORK
47	HUNTINGTON
48	BEAVER (UT)
48	DIXIE CREEK TENMILE CREEK
49	PAROWAN (UT)
49	ELKO SEGMENT
50	MILFORD (UT)
50	SUSIE CREEK
51	MAGGIE CREEK
51	CEDAR CITY (UT)
52	MARYS CREEK
52	LUND DISTRICT (UT)
53	BERYL ENTERPRISE DISTRICT (UT)
53	PINE
54	WAH WAH (UT)
54	CRESCENT
56	CARICO LAKE
56	UPPER REESE RIVER
57	ANTELOPE
58	MIDDLE REESE RIVER
59	LOWER REESE RIVER
60	WHIRLWIND
61	BOULDER FLAT
62	ROCK CREEK
64	CLOVERS
66	PUMPERNICKEL
70	WINNEMUCCA SEGMENT
71	GRASS
72	IMLAY
73	LOVELOCK
73A	LOVELOCK OREANA
74	WHITE PLAINS
75	BRADYS HOT SPRINGS
76	FERNLEY
77	FIREBALL
78	GRANITE SPRINGS
79	KUMIVA
80	WINNEMUCCA LAKE
81	PYRAMID LAKE
82	DODGE FLAT
83	TRACY SEGMENT
84	WARM SPRINGS
85	SPANISH SPRINGS
86	SUN
87	TRUCKEE MEADOWS
88	PLEASANT
89	WASHOE
90	LAKE TAHOE BASIN
91	TRUCKEE CANYON SEGMENT
92A	LEMMON WESTERN
92B	LEMMON EASTERN
93	ANTELOPE
94	BEDELL FLAT
95	DRY
96	NEWCOMB LAKE
97	HONEY LAKE
98	SKEDADDLE CREEK
99	RED ROCK
100	COLD SPRING
101	CARSON DESERT
101A	CARSON DESERT PACKARD
102	CHURCHILL
103	DAYTON
104	EAGLE
105	CARSON
106	ANTELOPE
107	SMITH
108	MASON
109	EAST WALKER
110A	WALKER LAKE SCHURZ
110B	WALKER LAKE LAKE
110C	WALKER LAKE WHISKEY FLAT HAWTHORNE
111A	ALKALI MINERAL NORTHERN
111B	ALKALI MINERAL SOUTHERN
112	MONO
113	HUNTOON
114	TEELS MARSH
117	FISH LAKE
118	COLUMBUS SALT MARSH
119	RHODES SALT MARSH
120	GARFIELD FLAT
121A	SODA SPRING EASTERN
121B	SODA SPRING WESTERN
122	GABBS
123	RAWHIDE FLATS
124	FAIRVIEW
125	STINGAREE
126	COWKICK
127	EASTGATE
128	DIXIE
129	BUENA VISTA
130	PLEASANT
131	BUFFALO
132	JERSEY
133	EDWARDS CREEK
136	MONTE CRISTO
137A	BIG SMOKY TONOPAH FLAT
137B	BIG SMOKY NORTH
138	GRASS
139	KOBEH
140A	MONITOR NORTHERN
140B	MONITOR SOUTHERN
141	RALSTON
142	ALKALI SPRING
143	CLAYTON
144	LIDA
145	STONEWALL FLAT
146	SCAROBATUS FLAT
147	GOLD FLAT
148	CACTUS FLAT
149	STONE CABIN
150	LITTLE FISH LAKE
151	ANTELOPE
152	STEVENS
153	DIAMOND
154	NEWARK
155A	LITTLE SMOKY NORTHERN
155B	LITTLE SMOKY CENTRAL
155C	LITTLE SMOKY SOUTHERN
156	HOT CREEK
157	KAWICH
158A	EMIGRANT GROOM LAKE
158B	EMIGRANT PAPOOSE LAKE
159	YUCCA FLAT
160	FRENCHMAN FLAT
161	INDIAN SPRINGS
162	PAHRUMP
163	MESQUITE
168	THREE LAKES
169A	TIKAPOO (TIKABOO) NORTHERN
169B	TIKAPOO (TIKABOO) SOUTHERN
170	PENOYER
171	COAL
172	GARDEN
173A	RAILROAD SOUTHERN
173B	RAILROAD NORTHERN
174	JAKES
175	LONG
176	RUBY
177	CLOVER
178A	BUTTE NORTH
178B	BUTTE SOUTH
179	STEPTOE
180	CAVE
181	DRY LAKE
182	DELAMAR
183	LAKE
184	SPRING
185	TIPPETT
186A	ANTELOPE (WHITE PINE AND ELKO) SOUTHERN
186B	ANTELOPE (WHITE PINE AND ELKO) NORTHERN
187	GOSHUTE
188	INDEPENDENCE
191	PILOT CREEK
194	PLEASANT
196	HAMLIN
198	DRY
199	ROSE
200	EAGLE
201	SPRING
202	PATTERSON
203	PANACA
204	CLOVER
205	MEADOW WASH
206	KANE SPRINGS
207	WHITE RIVER
208	PAHROC
209	PAHRANAGAT
210	COYOTE SPRINGS
211	THREE LAKES
212	LAS VEGAS
215	BLACK MOUNTAINS
216	GARNET
217	HIDDEN NORTH
218	CALIFORNIA WASH
219	MUDDY RIVER SPRINGS
220	LOWER MOAPA
221	TULE DESERT
222	VIRGIN RIVER
223	GOLD BUTTE
224	GREASEWOOD BASIN
225	MERCURY
226	ROCK
227A	FORTYMILE CANYON JACKASS FLATS
227B	FORTYMILE CANYON BUCKBOARD MESA
228	OASIS
229	CRATER FLAT
230	AMARGOSA DESERT
231	GRAPEVINE CANYON
232	ORIENTAL WASH

1689-B

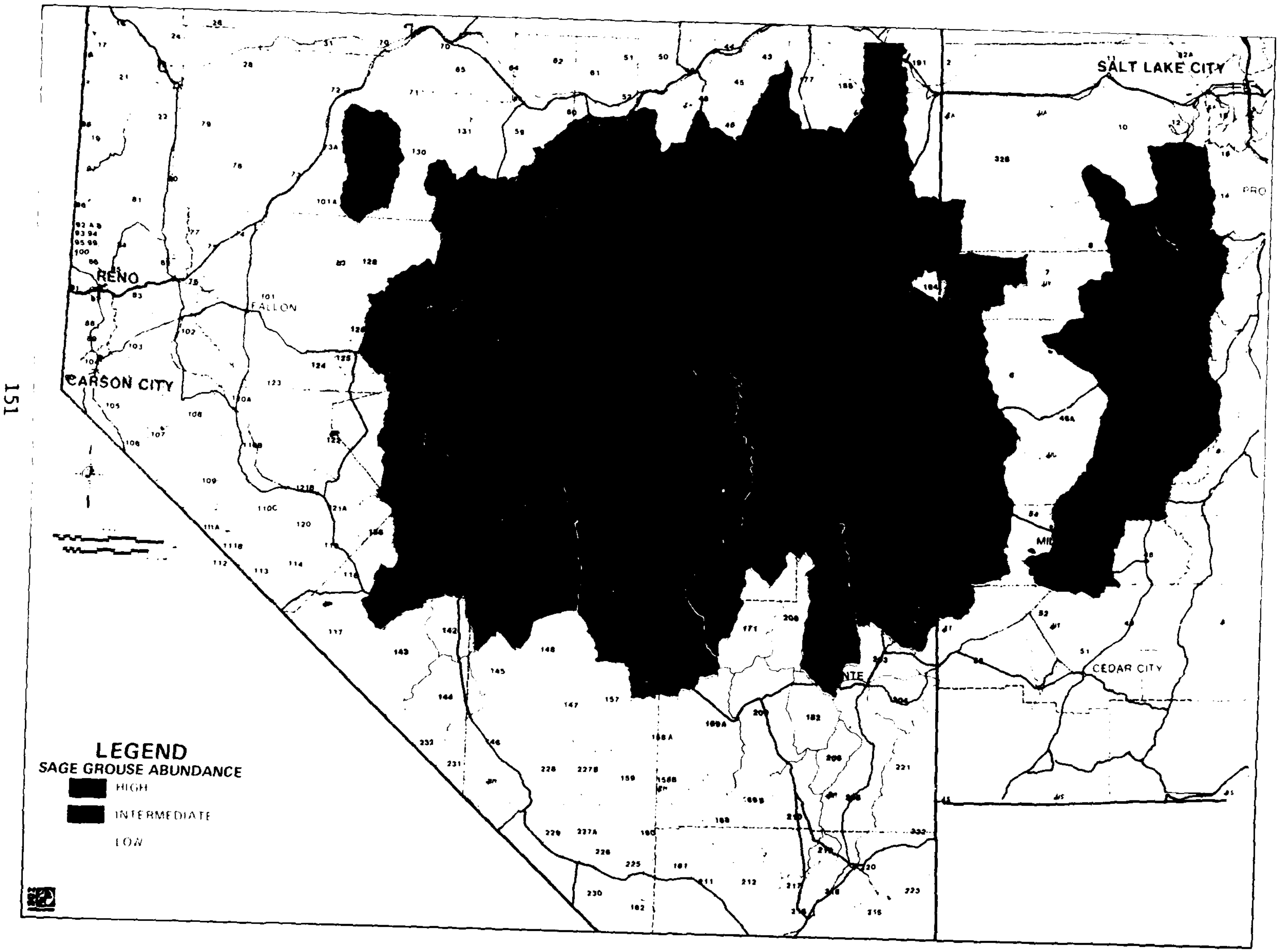

Figure 1.3.3.1-3. Sage grouse abundance ranking for hydrologic subunits in the Nevada/Utah study area.

traditional sites used for courtship displays, and brood use areas are sites with adequate water and cover for raising chicks. Breeding and nesting areas tend to be within 2 mi (3.2 km) of the strutting grounds (Gill, 1965; Martin, 1970; Wallestad and Pyvah, 1974; Autenrieth, 1976). Destruction or disturbances tend to cause the birds to abandon these areas, reducing reproductive success substantially (Wallestad, 1975; Peterson, 1970; Higby, 1969; Autenreith, 1976; Klebenow, 1970). Braun et al. (1977) recommended that alteration of vegetation should not be undertaken within 2 mi (3 km) of the strutting and nesting areas. Wintering grounds are limited areas in valleys that provide forage and cover when other parts of the range are covered with snow and, thus, are necessary for survival of the birds. Disturbance of these areas can result in abandonment (Higby, 1969).

Because sage grouse range and key habitat are unevenly distributed throughout the study area, potential direct impacts to this species will be valley and site-specific. Figures 1.3.3.1-4 and 1.3.3.1-5 show conceptual operating base and cluster layouts in two valleys. Construction of an operating base as shown in the Figure 1.3.3.1-4 would cause a loss of approximately 8,000 acres (3,200 ha) of habitat. The number of strutting grounds and brood use areas potentially impacted appears small, but only those that have been identified by wildlife managers are mapped; many more may actually be present. Construction of clusters as shown in Figure 1.3.3.1-5 would disturb approximately 6,179 acres (2,500 ha) of habitat for protective structures, cluster roads, and DTN combined. As a result, a large proportion of the known strutting grounds and brood use areas plus a wintering ground would be impacted. A more detailed impact analysis and evaluation of project alternatives is contained in the preceding section (Principal Impacts).

Two species of fur-bearing animals of special concern are the kit fox and bobcat. The kit fox, like the pronghorn and sage grouse, is sensitive because all of its preferred habitat is in lowlands where M-X may be sited (McGrew, 1979). Since kit foxes are unwary of man, many are killed each year by trapping, poisoning, and shooting (Egoscue, 1956, 1962). There are numerous accounts of foxes existing within city limits (Jensen, 1972), close to roads and occupied buildings (Egoscue, 1956, 1962), or in fields and levees adjacent to irrigated cropland (Swick, 1973; Morrell, 1975). Morrell (1975) indicates that this interaction should be considered marginal. Allison (1970) recommends that leaving an island or knoll of native vegetation covering 16 ha at various points should provide food and habitat for kit foxes. Impacts of clusters in valleys should be small once they are built, although kit fox populations may decline due to scarification during construction.

Bobcats are found throughout Nevada around most mountain ranges (Molini, 1980a). Riparian zones near streams and marshes may contain larger numbers of bobcats than the surrounding drier areas (Ashman, 1979). Bobcats are sensitive to human activities and may leave areas with large concentrations of humans. Most impact will not come from the direct construction of the M-X because this will occur in valleys where bobcats are in smaller numbers. Because pelts of bobcats are valuable and were selling for $314 each in 1979, trapping pressure is expected to intensify with the human population increase (Molini, 1980a).

Waterfowl are an important group of game animals in the study area. They depend on surface water for all phases of life. As previously discussed, wetlands will attract people for recreation, and this may cause deterioration or destruction of waterfowl habitat. The potential water drawdown may reduce habitat for ducks and

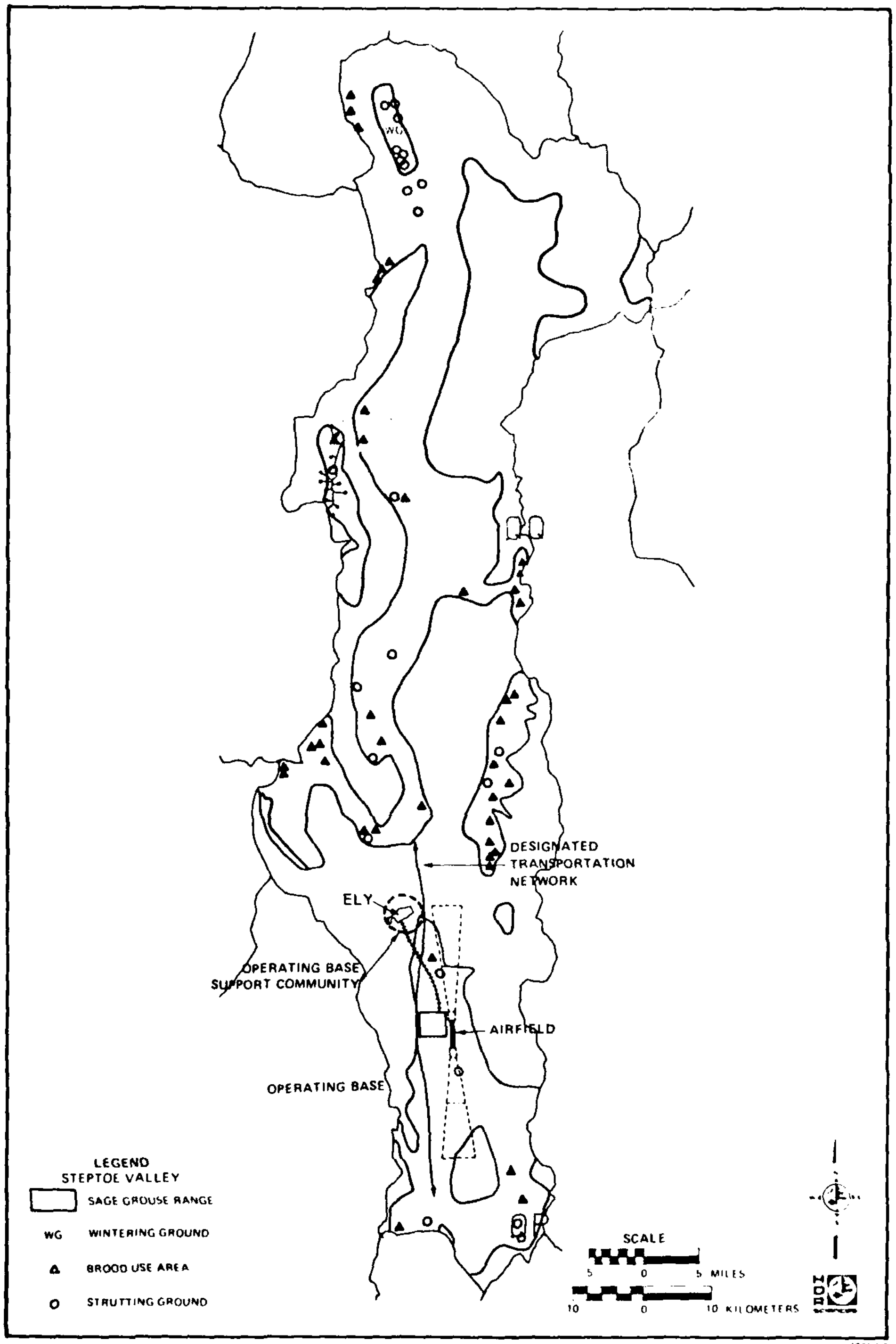

Figure 1.3.3.1-4. Conceptual operating base layout in Steptoe Valley and sage grouse habitat.

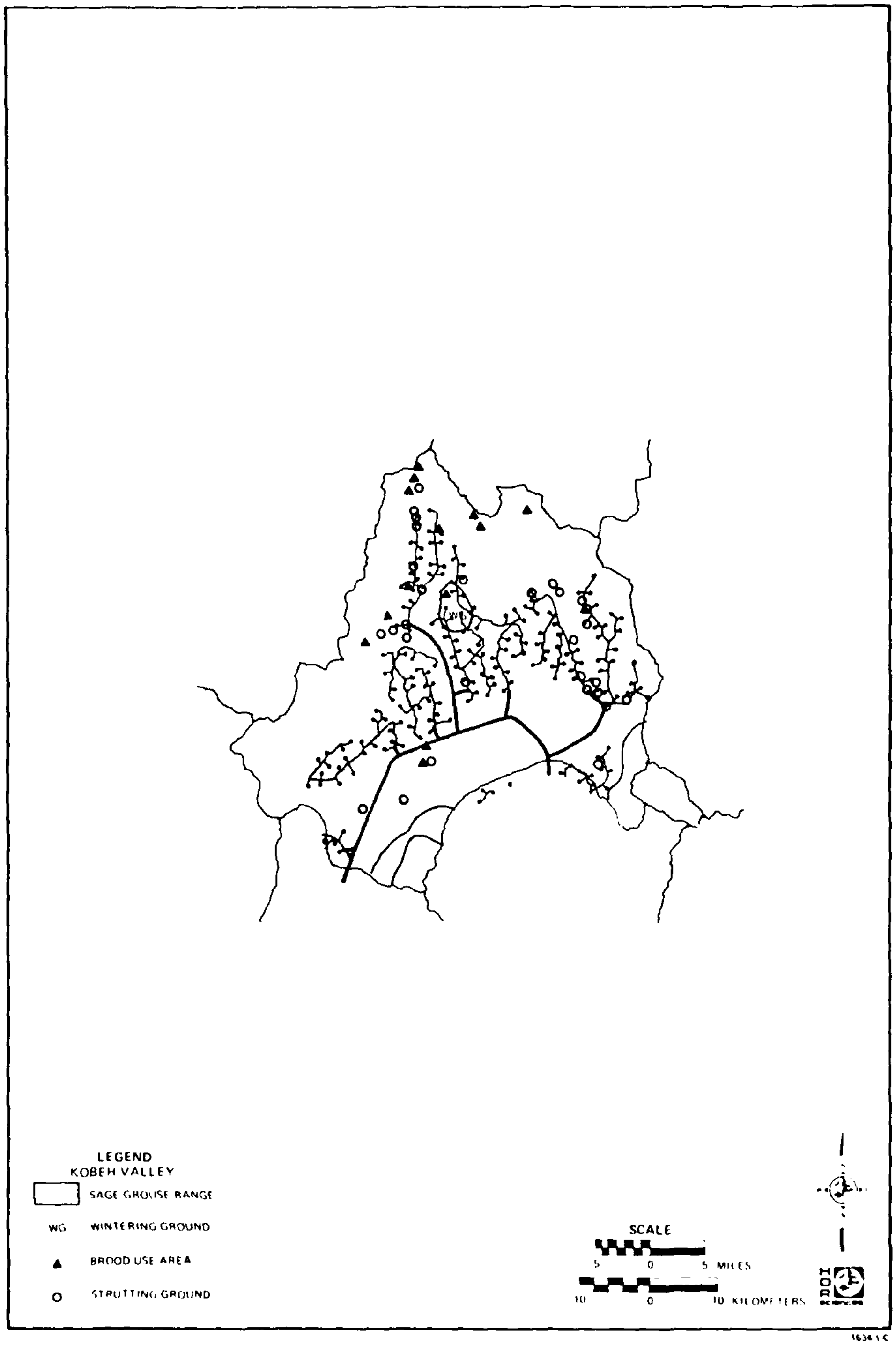

Figure 1.3.3.1-5. Conceptual cluster layout in Kobeh Valley and sage grouse habitat.

geese. Increased hunting pressure would require changes in the management program for these species. Poaching of waterfowl seems certain to occur in the remote areas occupied by M-X facilities.

Comparison among Hydrologic Subunits

In this section, the impacts of five important representative categories of wildlife resources are compared by hydrologic subunit throughout the study area. Information about their abundance, sensitivity to impact, and quality of data, by watershed, appears in Table 1.3.3.1-3 in the form of ranked values. The criteria for estimation of these values for each wildlife resource category are given below. These criteria are followed by a list of those hydrologic subunits that were rated highest in both resource abundance and sensitivity to impact. New data for certain wildlife groups have been received from the Utah DWR after this analysis had been completed. These data will be incorporated into analyses to be conducted in preparation of the FEIS.

Abundance in each hydrologic subunit was determined as follows: abundance was called high if (a) peak seasonal abundance exceeded 500 birds according to Nevada DOW estimates, or (b) in Utah the subunit contained a National Wildlife Refuge or State Wildlife Management Area managed for waterfowl. Abundance was called intermediate if high abundance criteria were not met and if the subunit contained major waterfowl areas as mapped by Nevada DOW and Utah DWR. All other subunits were considered of low waterfowl abundance. Figure 1.3.3.1-6 is a map of these rankings.

Sensitivity to impact was considered high if the hydrologic subunit had a high or intermediate abundance rating. This judgment is based on the fact that all such subunits have significant wetland areas, and wetlands are highly sensitive to impact. Sensitivity was rated low if abundance was low, since low abundance implied lack of significant wetlands.

Data quality were regarded as high numerical estimates of abundance provided by the Nevada DOW were available or if, in Utah, the hydrologic subunit contained a National Wildlife Refuge or Wildlife Management area managed for waterfowl. Data quality were regarded as intermediate in all other hydrologic subunit since hydrologic subunit-specific maps of major waterfowl areas were available for both states.

The following hydrologic subunits were rated high in resource abundance and high in sensitivity to impact: Fish Springs, Sevier Desert, Upper Reese River, Monitor, Little Fish Lake, Newark, Railroad northern, Ruby, Steptoe, Spring, White River, and Pahranagat. (See Figure 1.3.3.1-7, Hydrologic Subunit of Highest Abundance and Sensitivity for Waterfowl, for the location of these hydrologic subunits in the study area.) The siting of M-X project features in these hydrologic subunits would have the potential for the most damage to the waterfowl resource.

Abundance was considered high if the hydrologic subunit contained key habitat for pronghorn. Key habitat has been defined by the Nevada Department of Wildlife to be areas providing water and forage during critical times of the year (winter or summer) and fawning areas. Abundance was considered medium if the hydrologic subunit contained pronghorn range but not key habitat. Abundance was rated low if

Table 1.3.3.1-3. Abundance, sensitivity to impact, and quality of data: wildlife, Nevada/Utah, by hydrologic subunit.

NUMBER	LOCATION	T/E TERRESTRIAL ANIMALS[1]			PRONGHORN			OTHER BIG GAME[2]			SAGE GROUSE			OTHER UPLAND GAME[3]			WATERFOWL		
		A	S	Q	A	S	Q	A	S	Q	A	S	Q	A	S	Q	A	S	Q
3	Deep Creek	L	L	H	I	H	I	I	I	I	I	I	I	I	L	L	I	H	I
4	Snake	I	I	H	H	H	I	H	H	H	I	I	I	H	L	L	I	H	I
5(U)	Pine	H	H	H	I	H	I	I	H	I	I	I	I	I	L	L	L	L	H
6	White	L	L	H	I	H	I	L	I	I	L	L	I	I	L	L	L	L	H
7	Fish Springs	H	I	H	I	H	I	L	I	I	L	L	I	I	L	L	H	H	H
8	Dugway	L	L	H	I	H	I	L	I	I	L	L	I	I	L	I	L	L	H
9	Government Creek	H	H	H	I	H	I	I	I	I	I	I	I	I	L	L	L	L	H
13	Rush	H	H	H	L	H	I	I	I	I	H	I	I	I	L	L	I	H	H
32b	Great Salt Lake Desert-Western Desert	L	L	H	I	H	I	L	L	I	L	L	I	I	L	L	L	L	H
46	Sevier Desert	I	I	H	I	H	I	I	I	I	I	I	I	I	L	L	H	H	H
46a	Sevier Desert-Dry Lake	L	L	H	I	H	I	L	I	I	L	L	I	I	L	L	L	L	H
47	Huntington	L	L	H	L	L	H	H	I	H	H	I	H	H	L	I	L	L	I
50	Milford	I	I	H	I	H	I	L	I	I	I	I	I	I	L	L	L	L	H
52	Lund District	L	L	H	I	H	I	L	I	I	L	L	I	L	L	L	L	L	H
53(N)	Pine	L	L	H	H	H	H	I	I	H	H	I	H	H	L	I	I	H	I
53(U)	Beryl-Enterprise District	L	L	H	I	H	I	L	I	I	L	L	I	L	L	L	L	L	H
54(U)	Wah Wah	I	H	H	I	H	I	L	I	I	L	L	I	L	L	L	L	L	H
54(N)	Crescent	H	I	I	I	H	H	L	I	H	I	I	H	H	L	I	L	L	H
55	Carico Lake	L	L	I	L	L	H	L	I	H	H	I	H	I	L	I	L	L	I
56	Upper Reese River	L	L	I	L	L	H	I	I	H	H	I	H	H	L	I	H	H	I
57	Antelope	L	L	I	L	L	H	L	I	H	I	I	H	I	L	I	L	L	H
58	Middle Reese River	L	L	I	L	L	H	L	I	H	I	I	H	I	L	I	L	L	H
122	Gabbs	L	L	I	L	L	H	L	L	H	L	L	H	I	L	I	L	L	H
124	Fairview	L	L	I	L	L	H	L	L	H	L	L	H	L	L	I	L	L	H
125	Stingaree	L	L	I	L	L	H	L	L	H	L	L	H	L	L	I	L	L	H
126	Cowkick	L	L	I	L	L	H	L	L	H	L	L	H	L	L	I	L	L	H
127	Eastgate	L	L	I	L	L	H	L	L	H	I	I	H	I	L	I	L	L	H
133	Edwards Creek	L	L	I	L	L	H	L	L	H	I	I	H	I	L	I	L	L	H
134	Smith Creek	L	L	I	I	H	H	L	I	H	H	I	H	I	L	I	L	L	H
135	Ione	L	L	I	L	L	H	L	I	H	I	I	H	I	L	I	L	L	H
136	Monte Cristo	L	L	I	L	L	H	L	I	H	L	L	H	I	L	I	L	L	H
137a	Big Smoky-Tonopah Flat	L	L	I	L	L	H	H	H	H	I	I	H	H	L	I	L	L	I
137b	Big Smoky-North	L	L	I	H	H	H	H	H	H	H	I	H	I	L	I	I	H	I
138	Grass	L	L	I	L	L	H	L	I	H	H	I	H	I	L	I	L	L	H
139	Kobeh	L	L	I	H	H	H	L	I	H	H	I	I	I	L	I	I	H	I
140	Monitor	L	L	I	H	H	H	H	H	H	H	I	H	I	L	I	H	H	H
141	Ralston	L	L	I	H	H	H	I	I	H	I	I	H	I	L	I	I	H	I
142	Alkali Spring	L	L	I	L	L	H	L	L	H	L	L	H	I	L	I	I	H	I
143	Clayton	L	L	I	L	L	H	L	L	H	L	L	H	I	L	I	L	L	H
144	Lida	L	L	I	I	H	H	L	L	H	L	L	H	L	L	I	I	H	I
149	Stone Cabin	L	L	I	H	H	H	I	I	H	I	I	H	I	L	I	L	L	I
150	Little Fish Lake	L	L	I	H	H	H	H	H	H	H	I	H	H	L	I	H	H	H
151	Antelope	H	I	I	I	H	H	I	I	H	H	I	H	I	L	I	I	H	H
152	Stevens	L	L	I	L	L	H	I	I	H	H	I	H	L	L	I	L	L	H
153	Diamond	L	L	I	L	L	H	I	I	H	H	I	H	I	L	I	I	H	H
154	Newark	L	L	I	L	L	H	I	I	H	H	I	H	I	L	I	H	H	H
155	Little Smoky	L	L	I	I	H	H	L	L	H	H	I	H	I	L	I	I	H	I
156	Hot Creek	L	L	I	H	H	H	L	L	H	H	I	H	I	L	I	I	H	I
169a	Tikaboo-Northern	I	H	I	L	L	H	H	H	H	L	L	H	I	L	I	L	L	H
170	Penoyer	L	L	I	I	H	H	L	L	H	I	I	H	I	L	I	L	L	H
171	Coal	L	L	I	L	L	H	L	L	H	L	L	H	I	L	I	L	L	H
172	Garden	L	L	I	L	L	H	H	H	H	H	I	H	I	L	I	I	H	I
173a	Railroad-Southern	L	L	I	H	H	H	L	L	H	I	I	H	L	L	I	H	H	H
173b	Railroad-Northern	L	L	I	H	H	H	H	H	H	I	I	H	I	L	I	I	H	H
174	Jakes	L	L	I	L	L	H	L	L	H	H	I	H	I	L	I	L	L	H
175	Long	L	L	I	L	L	H	L	L	H	H	I	H	I	L	I	I	H	H
176	Ruby	H	I	I	H	H	H	H	H	H	H	I	H	I	L	I	H	H	H
178	Butte	I	I	I	L	L	H	I	I	H	H	I	H	I	L	I	I	H	I
179	Steptoe	H	I	I	H	H	H	H	H	H	H	I	H	I	L	I	H	H	H
180	Cave	L	L	I	L	L	H	I	I	H	H	I	H	I	L	I	L	L	H
181	Dry Lake	L	L	I	L	L	H	L	L	H	I	I	H	I	L	I	L	L	H
182	Delamar	L	L	I	L	L	H	I	I	H	L	L	H	I	L	I	L	L	H
183	Lake	L	L	I	H	H	H	I	I	H	H	I	H	I	L	I	I	H	I
184	Spring	H	I	I	H	H	H	H	H	H	H	I	H	I	L	I	H	H	H
185	Tippett	L	L	I	H	H	H	L	L	H	I	I	H	I	L	I	L	L	H
186	Antelope	H	I	I	H	H	H	L	L	H	H	I	H	L	L	I	L	L	H
187	Goshute	H	I	I	H	H	H	L	L	H	H	I	H	I	L	I	L	L	H
194	Pleasant	L	L	I	L	L	H	L	L	I	L	L	H	I	L	I	L	L	H
196	Hamlin	L	L	I	H	H	H	I	H	H	H	I	H	I	L	L	I	H	H
198	Dry	L	L	I	L	L	H	L	L	H	I	I	H	I	L	I	I	H	I
199	Rose	L	L	I	L	L	H	L	L	H	H	I	H	I	L	I	L	L	H
200	Eagle	L	L	I	L	L	H	L	L	H	I	I	H	I	L	I	L	L	H
201	Spring	L	L	I	L	L	H	I	I	H	H	I	H	I	L	I	I	H	H
202	Patterson	L	L	I	H	H	H	L	L	H	H	I	H	I	L	I	L	L	H
203	Panaca	L	L	I	L	L	H	L	L	H	L	L	H	I	L	I	I	H	I
204	Clover	L	L	I	L	L	H	L	L	H	L	L	H	I	L	I	I	H	I
205	Meadow Valley Wash	I	H	I	L	L	H	H	H	H	L	L	H	I	L	I	I	H	I
206	Kane Springs	I	H	I	L	L	H	H	H	H	L	L	H	I	L	I	L	L	H
207	White River	I	H	I	L	L	H	H	H	H	H	I	H	I	L	I	H	H	H
208	Pahroc	H	H	I	L	L	H	L	L	H	L	L	H	I	L	I	L	L	H
209	Pahranagat	H	H	I	L	L	H	H	H	H	L	L	H	I	L	I	H	H	H
210	Coyote Springs	I	H	I	L	L	H	H	H	H	L	L	H	I	L	I	I	H	I
219	Muddy River Springs	I	H	I	L	L	H	I	H	H	L	L	H	I	L	I	I	H	I
128	Dixie	L	L	I	L	L	H	L	L	H	L	L	H	L	L	I	I	H	I
129	Buena Vista	L	L	I	L	L	H	L	L	H	I	I	H	L	L	I	L	L	H
132	Jersey	L	L	I	L	L	H	L	L	H	I	I	H	I	L	I	L	L	H

2313

[1]Includes bald eagle, Utah prairie dog, and desert tortoise.

[2]Includes bighorn sheep, mule deer, elk.

[3]Includes sage grouse, chukkar, and quail.

WATERSHEDS IN THE NEVADA UTAH STUDY AREA

LEGEND

2	PILOT
4	SNAKE
5	PINE
6	WHITE
7	FISH SPRINGS
8	DUGWAY
9	GOVERNMENT CREEK
10	SKULL
11	SINK
12	TOOELE
13	RUSH
14	CEDAR
16	GOSHEN
[illegible]	PILGRIM FLAT
[illegible]	PAINTER FLAT
[illegible]	NORTHERN [illegible]
[illegible]	[illegible]
[illegible]	JORDAN [illegible]
[illegible]	SMOKE CREEK DESERT
22	SAN EMIDIO DESERT
[illegible]	GRANITE BASIN
[illegible]	HUALAPAI FLAT
[illegible]	[illegible] MEADOW
[illegible]	BLACK ROCK DESERT
[illegible]	DESERT
32A	GREAT SALT LAKE DESERT [illegible]
32B	GREAT SALT LAKE DESERT WESTERN DESERT
43	STARR
44	NORTH FORK
45	LAMOILLE
46	SEVIER DESERT [illegible]
46A	SEVIER DESERT [illegible]
[illegible]	SOUTH FORK
[illegible]	HUNTINGTON
[illegible]	BEAVER [illegible]
[illegible]	[illegible] CREEK [illegible] CREEK
[illegible]	PAROWAN [illegible]
[illegible]	ELKO SEGMENT
50	MILFORD [illegible]
[illegible]	[illegible] CREEK
[illegible]	MAGGIE CREEK
[illegible]	CEDAR CITY [illegible]
[illegible]	MARYS CREEK
[illegible]	[illegible] DISTRICT [illegible]
[illegible]	BERYL ENTERPRISE DISTRICT [illegible]
[illegible]	PINE
[illegible]	WAH WAH [illegible]
[illegible]	CRESCENT
[illegible]	CARICO LAKE
[illegible]	UPPER REESE RIVER
[illegible]	ANTELOPE
[illegible]	MIDDLE REESE RIVER
[illegible]	LOWER REESE RIVER
[illegible]	WHIRLWIND
[illegible]	[illegible]
[illegible]	[illegible] CREEK
[illegible]	[illegible]
[illegible]	PUMPERNICKEL
[illegible]	WINNEMUCCA SEGMENT
[illegible]	GRASS
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	WATER [illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	WINNEMUCCA [illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible] SEGMENT
[illegible]	WARM SPRINGS
[illegible]	[illegible] SPRINGS
[illegible]	[illegible]
[illegible]	[illegible] MEADOWS
[illegible]	PLEASANT
[illegible]	[illegible]
[illegible]	[illegible] BASIN
[illegible]	[illegible] SEGMENT

1691 P

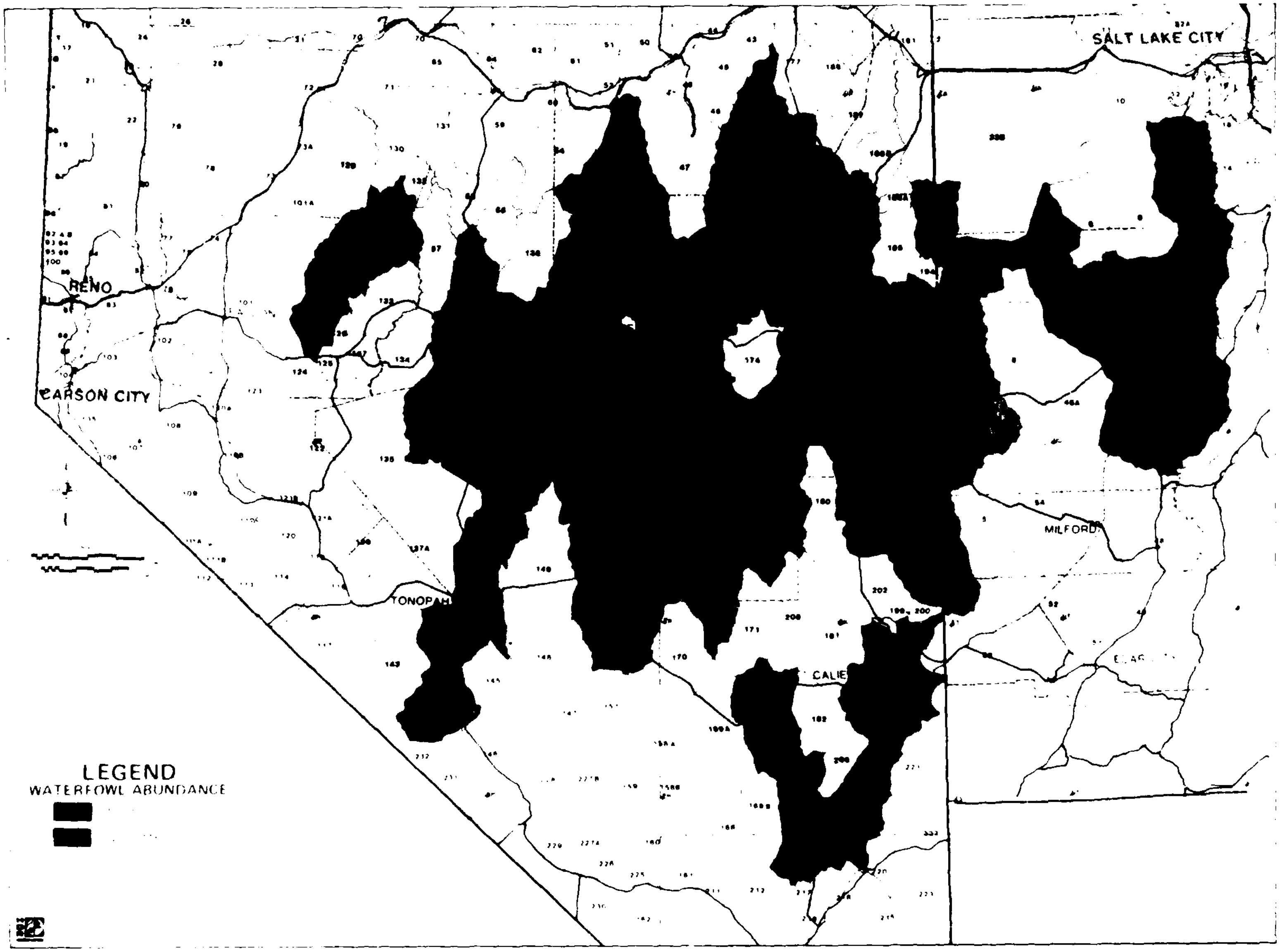

Figure 1.3.3.1-6. Waterfowl abundance for hydrologic subunits in the Nevada/Utah study area.

the hydrologic subunit did not contain mapped pronghorn range. Figure 1.3.3.1-1 shows the distribution of these rankings for the study area.

Sensitivity to impact was considered high in all hydrologic subunits which contained mapped pronghorn range. There was no intermediate category for level of sensitivity. Sensitivity was rated low if the hydrologic subunit contained no mapped pronghorn range.

Quality of data was rated high for all hydrologic subunits in which the Nevada Department of Wildlife provided a map with pronghorn key habitat and total range. Intermediate levels of data quality applied to hydrologic subunits for which the Utah Division of Wildlife Resources provided a map with total range. The low category was not used.

The following hydrologic subunits were rated high in pronghorn antelope abundance and high sensitivity to impact: Snake, Pine (Nevada), Big Smoky-north, Kobeh, Monitor, Ralston, Stone Cabin, Little Fish Lake, Hot Creek, Railroad-southern, Railroad-northern, Ruby, Steptoe, Lake, Spring, Tippett, Antelope, Patterson, Hamlin, and Goshute. Figure 1.3.3.1-8 shows the location of these hydrologic subunits in the study area. The siting of M-X project features in these hydrologic subunits would have the potential for the most damage to the pronghorn antelope resource.

Abundance was considered high if the Nevada Department of Wildlife big game investigation reports indicated high abundance for mule deer or bighorn sheep. Population estimates of wildlife species in Nevada were obtained from Nevada Department Wildlife (DOW) input into land management agencies planning systems. These reports, entitled "Wildlife Habitat Plans for the Future," cover various Bureau of Land Management planning units and list "reasonable numbers" of wildlife species in ranges delineated on topographic maps (1:250,000).

Reasonable numbers for deer were calculated by the Nevada DOW using their Selleck-Hart formula. The number of years used to draw information depended on the validity of the data base in a particular management area; a 15 year long-term average was generally used. Best estimates were applied in areas where the data base was lacking.

Nevada DOW population estimates for pronghorn, elk, bighorn sheep, and mountain lion were derived from survey data (ground and air) corrected by adding the estimated percentage of animals not seen. Reasonable numbers are an average of the long-term population estimates. Allowances were made for expansion of reasonable numbers to desired populations based on long-term history or special considerations.

Complications of reasonable number estimates in some management areas occurred because of migrant animals, overlapping boundaries, and intermittent seasons of use. In those cases, that portion of a population that actually resided within a given BLM Unit Resource Analysis area or U.S. Forest Service Land Use Plan area boundary were divided out of the management area figure as a percentage of the total and converted to actual numbers by the Nevada DOW. Abundance was also rated high if the distribution maps provided by the state wildlife agencies indicated that mule deer abundance was at intermediate levels and at least one

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WATERSHEDS IN THE NEVADA/UTAH STUDY AREA

LEGEND

2 PILOT
4 SNAKE
5 PINE
6 WHITE
7 FISH SPRINGS
8 DUGWAY
9 GOVERNMENT CREEK
10 SKULL
11 SINK
12 TOOELE
13 RUSH
14 CEDAR
16 GOSHEN
17 PILGRIM FLAT
18 PAINTER FLAT
18 NORTHERN UTAH LAKE (UT)
19 DRY
19 JORDAN (UT)
21 SMOKE CREEK DESERT
22 SAN EMIDIO DESERT
23 GRANITE BASIN
24 HUALAPAI FLAT
26 MUD MEADOW
28 BLACK ROCK DESERT
31 DESERT
32A GREAT SALT LAKE DESERT - LAKE
32B GREAT SALT LAKE DESERT WESTERN DESERT
43 STARR
44 NORTH FORK
45 LAMOILLE
46 SEVIER DESERT (UT)
46A SEVIER DESERT - DRY LAKE (UT)
46 SOUTH FORK
47 HUNTINGTON
48 BEAVER (UT)
48 DIXIE CREEK - TENMILE CREEK
49 PAROWAN (UT)
49 ELKO SEGMENT
50 MILFORD (UT)
50 SUSIE CREEK
51 MAGGIE CREEK
51 CEDAR CITY (UT)
52 MARYS CREEK
52 LUND DISTRICT (UT)
53 BERYL ENTERPRISE DISTRICT (UT)
53 PINE
54 WAH WAH (UT)
54 CRESCENT
55 CARICO LAKE
56 UPPER REESE RIVER
57 ANTELOPE
58 MIDDLE REESE RIVER
59 LOWER REESE RIVER
60 WHIRLWIND
61 BOULDER FLAT
62 ROCK CREEK
64 CLOVERS
65 PUMPERNICKEL
70 WINNEMUCCA SEGMENT
71 GRASS
72 IMLAY
73 LOVELOCK
73A LOVELOCK - OREANA
74 WHITE PLAINS
75 BRADYS HOT SPRINGS
76 FERNLEY
77 FIREBALL
78 GRANITE SPRINGS
79 KUMIVA
80 WINNEMUCCA LAKE
81 PYRAMID LAKE
82 DODGE FLAT
83 TRACY SEGMENT
84 WARM SPRINGS
85 SPANISH SPRINGS
86 SUN
87 TRUCKEE MEADOWS
88 PLEASANT
89 WASHOE
90 LAKE TAHOE BASIN
91 TRUCKEE CANYON SEGMENT
92A LEMMON - WESTERN
92B LEMMON - EASTERN
93 ANTELOPE
94 BEDELL FLAT
95 DRY
96 NEWCOMB LAKE
97 HONEY LAKE
98 SKEDADDLE CREEK
99 RED ROCK
100 COLD SPRING
101 CARSON DESERT
101A CARSON DESERT - PACKARD
102 CHURCHILL
103 DAYTON
104 EAGLE
105 CARSON
106 ANTELOPE
107 SMITH
108 MASON
109 EAST WALKER
110A WALKER LAKE - SCHURZ
110B WALKER LAKE - LAKE
110C WALKER LAKE - WHISKEY FLAT - HAWTHORNE
111A ALKALI MINERAL - NORTHERN
111B ALKALI MINERAL - SOUTHERN
112 MONO
113 HUNTOON
114 TEELS MARSH
117 FISH LAKE
118 COLUMBUS SALT MARSH
119 RHODES SALT MARSH
120 GARFIELD FLAT
121A SODA SPRING - EASTERN
121B SODA SPRING - WESTERN
122 GABBS
123 RAWHIDE FLATS
124 FAIRVIEW
125 STINGAREE
126 COWKICK
127 EASTGATE
128 DIXIE
129 BUENA VISTA
130 PLEASANT
131 BUFFALO
132 JERSEY
133 EDWARDS CREEK
136 MONTE CRISTO
137A BIG SMOKY - TONOPAH FLAT
137B BIG SMOKY - NORTH
138 GRASS
139 KOBEH
140A MONITOR - NORTHERN
140B MONITOR - SOUTHERN
141 RALSTON
142 ALKALI SPRING
143 CLAYTON
144 LIDA
145 STONEWALL FLAT
146 SCAROBATUS FLAT
147 GOLD FLAT
148 CACTUS FLAT
149 STONE CABIN
150 LITTLE FISH LAKE
151 ANTELOPE
152 STEVENS
153 DIAMOND
154 NEWARK
155A LITTLE SMOKY - NORTHERN
155B LITTLE SMOKY - CENTRAL
155C LITTLE SMOKY - SOUTHERN
156 HOT CREEK
157 KAWICH
158A EMIGRANT - GROOM LAKE
158B EMIGRANT - PAPOOSE LAKE
159 YUCCA FLAT
160 FRENCHMAN FLAT
161 INDIAN SPRINGS
162 PAHRUMP
163 MESQUITE
168 THREE LAKES
169A TIKAPOO - TIKABOO - NORTHERN
169B TIKAPOO - TIKABOO - SOUTHERN
170 PENOYER
171 COAL
172 GARDEN
173A RAILROAD - SOUTHERN
173B RAILROAD - NORTHERN
174 JAKES
175 LONG
176 RUBY
177 CLOVER
178A BUTTE - NORTH
178B BUTTE - SOUTH
179 STEPTOE
180 CAVE
181 DRY LAKE
182 DELAMAR
183 LAKE
184 SPRING
185 TIPPETT
186A ANTELOPE (WHITE PINE AND ELKO) - SOUTHERN
186B ANTELOPE (WHITE PINE AND ELKO) - NORTHERN
187 GOSHUTE
188 INDEPENDENCE
191 PILOT CREEK
194 PLEASANT
196 HAMLIN
198 DRY
199 ROSE
200 EAGLE
201 SPRING
202 PATTERSON
203 PANACA
204 CLOVER
205 MEADOW WASH
206 KANE SPRINGS
207 WHITE RIVER
208 PAHROC
209 PAHRANAGAT
210 COYOTE SPRINGS
211 THREE LAKES
212 LAS VEGAS
215 BLACK MOUNTAINS
216 GARNET
217 HIDDEN - NORTH
218 CALIFORNIA WASH
219 MUDDY RIVER SPRINGS
220 LOWER MOAPA
221 TULE DESERT
222 VIRGIN RIVER
223 GOLD BUTTE
224 GREASEWOOD BASIN
225 MERCURY
226 ROCK
227A FORTYMILE CANYON - JACKASS FLATS
227B FORTYMILE CANYON - BUCKBOARD MESA
228 OASIS
229 CRATER FLAT
230 AMARGOSA DESERT
231 GRAPEVINE CANYON
232 ORIENTAL WASH

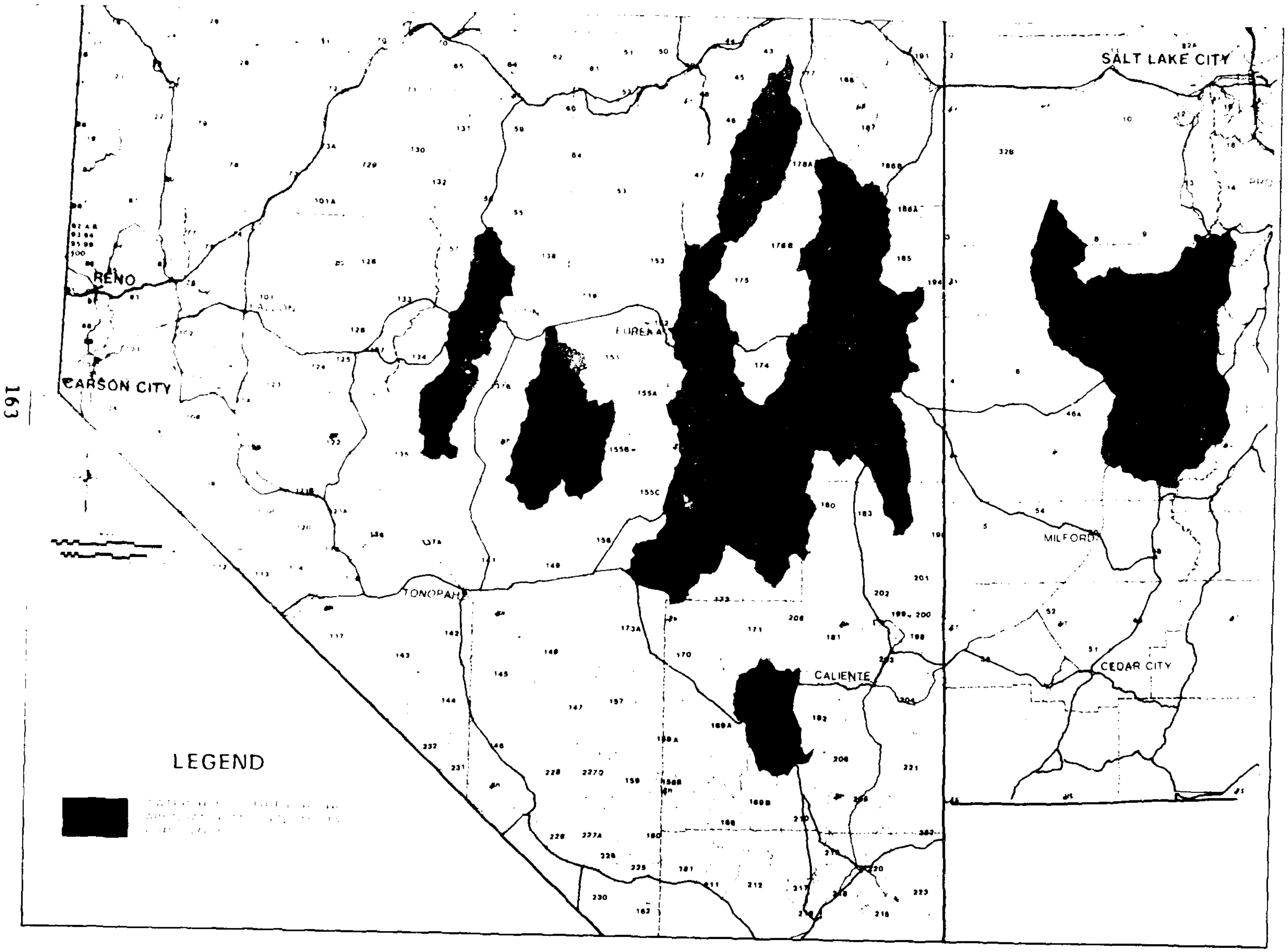

Figure 1.3.3.1-7. Highest abundance and sensitivity for waterfowl in Nevada/Utah study area.

WATERSHEDS IN THE NEVADA/UTAH STUDY AREA

LEGEND

2 PILOT
4 SNAKE
5 PINE
6 WHITE
7 FISH SPRINGS
8 DUGWAY
9 GOVERNMENT CREEK
10 SKULL
11 SINK
12 TOOELE
13 RUSH
14 CEDAR
16 GOSHEN
17 PILGRIM FLAT
18 PAINTER FLAT
18 NORTHERN UTAH LAKE UT
19 DRY
19 JORDAN UT
21 SMOKE CREEK DESERT
22 SAN EMIDIO DESERT
23 GRANITE BASIN
24 HUALAPAI FLAT
26 MUD MEADOW
28 BLACK ROCK DESERT
31 DESERT
32A GREAT SALT LAKE DESERT LAKE
32B GREAT SALT LAKE DESERT WESTERN DESERT
43 STARR
44 NORTH FORK
45 LAMOILLE
46 SEVIER DESERT UT
46A SEVIER DESERT DRY LAKE UT
46 SOUTH FORK
47 HUNTINGTON
48 BEAVER UT
48 DIXIE CREEK TENMILE CREEK
49 PAROWAN UT
49 ELKO SEGMENT
50 MILFORD UT
50 SUSIE CREEK
51 MAGGIE CREEK
51 CEDAR CITY UT
52 MARYS CREEK
52 COND DISTRICT UT
53 BERYL ENTERPRISE DISTRICT UT
53 PINE
54 WAH WAH UT
54 CRESCENT
56 CARICO LAKE
56 UPPER REESE RIVER
57 ANTELOPE
58 MIDDLE REESE RIVER
59 LOWER REESE RIVER
60 WHIRLWIND
61 BOULDER FLAT
62 ROCK CREEK
64 CLOVERS
65 PUMPERNICKEL
70 WINNEMUCCA SEGMENT
71 GRASS
72 IMLAY
73 LOVELOCK
73A LOVELOCK OREANA
74 WHITE PLAINS
75 BRADYS HOT SPRINGS
76 FERNLEY
77 FIREBALL
78 GRANITE SPRINGS
79 KUMIVA
80 WINNEMUCCA LAKE
81 PYRAMID LAKE
82 DODGE FLAT
83 TRACY SEGMENT
84 WARM SPRINGS
85 SPANISH SPRINGS
86 SUN
87 TRUCKEE MEADOWS
88 PLEASANT
89 WASHOE
90 LAKE TAHOE BASIN
91 TRUCKEE CANYON SEGMENT
92A LEMMON WESTERN
92B LEMMON EASTERN
93 ANTELOPE
94 BEDELL FLAT
95 DRY
96 NEWCOMB LAKE
97 HONEY LAKE
98 SKEDADDLE CREEK
99 RED ROCK
100 COLD SPRING
101 CARSON DESERT
101A CARSON DESERT PACKARD
102 CHURCHILL
103 DAYTON
104 EAGLE
105 CARSON
106 ANTELOPE
107 SMITH
108 MASON
109 EAST WALKER
110A WALKER LAKE SCHURZ
110B WALKER LAKE LAKE
110C WALKER LAKE WHISKEY FLAT HAWTHORNE
111A ALKALI MINERAL NORTHERN
111B ALKALI MINERAL SOUTHERN
112 MONO
113 HUNTOON
114 TEELS MARSH
117 FISH LAKE
118 COLUMBUS SALT MARSH
119 RHODES SALT MARSH
120 GARFIELD FLAT
121A SODA SPRING EASTERN
121B SODA SPRING WESTERN
122 GABBS
123 RAWHIDE FLATS
124 FAIRVIEW
125 STINGAREE
126 COWKICK
127 EASTGATE
128 DIXIE
129 BUENA VISTA
130 PLEASANT
131 BUFFALO
132 JERSEY
133 EDWARDS CREEK
136 MONTE CRISTO
137A BIG SMOKY TONOPAH FLAT
137B BIG SMOKY NORTH
138 GRASS
139 KOBEH
140A MONITOR NORTHERN
140B MONITOR SOUTHERN
141 RALSTON
142 ALKALI SPRING
143 CLAYTON
144 LIDA
145 STONEWALL FLAT
146 SARCOBATUS FLAT
147 GOLD FLAT
148 CACTUS FLAT
149 STONE CABIN
150 LITTLE FISH LAKE
151 ANTELOPE
152 STEVENS
153 DIAMOND
154 NEWARK
155A LITTLE SMOKY NORTHERN
155B LITTLE SMOKY CENTRAL
155C LITTLE SMOKY SOUTHERN
156 HOT CREEK
157 KAWICH
158A EMIGRANT GROOM LAKE
158B EMIGRANT PAPOOSE LAKE
159 YUCCA FLAT
160 FRENCHMAN FLAT
161 INDIAN SPRINGS
162 PAHRUMP
163 MESQUITE
168 THREE LAKES
169A TIKAPOO TIKABOO NORTHERN
169B TIKAPOO TIKABOO SOUTHERN
170 PENOYER
171 COAL
172 GARDEN
173A RAILROAD SOUTHERN
173B RAILROAD NORTHERN
174 JAKES
175 LONG
176 RUBY
177 CLOVER
178A BUTTE NORTH
178B BUTTE SOUTH
179 STEPTOE
180 CAVE
181 DRY LAKE
182 DELAMAR
183 LAKE
184 SPRING
185 TIPPETT
186A ANTELOPE WHITE PINE AND ELKO SOUTHERN
186B ANTELOPE WHITE PINE AND ELKO NORTHERN
187 GOSHUTE
188 INDEPENDENCE
191 PILOT CREEK
194 PLEASANT
196 HAMLIN
198 DRY
199 ROSE
200 EAGLE
201 SPRING
202 PATTERSON
203 PANACA
204 CLOVER
205 MEADOW WASH
206 KANE SPRINGS
207 WHITE RIVER
208 PAHROC
209 PAHRANAGAT
210 COYOTE SPRINGS
211 THREE LAKES
212 LAS VEGAS
215 BLACK MOUNTAINS
216 GARNET
217 HIDDEN NORTH
218 CALIFORNIA WASH
219 MUDDY RIVER SPRINGS
220 LOWER MOAPA
221 TULE DESERT
222 VIRGIN RIVER
223 GOLD BUTTE
224 GREASEWOOD BASIN
225 MERCURY
226 ROCK
227A FORTYMILE CANYON JACKASS FLATS
227B FORTYMILE CANYON BUCKBOARD MESA
228 OASIS
229 CRATER FLAT
230 AMARGOSA DESERT
231 GRAPEVINE CANYON
232 ORIENTAL WASH

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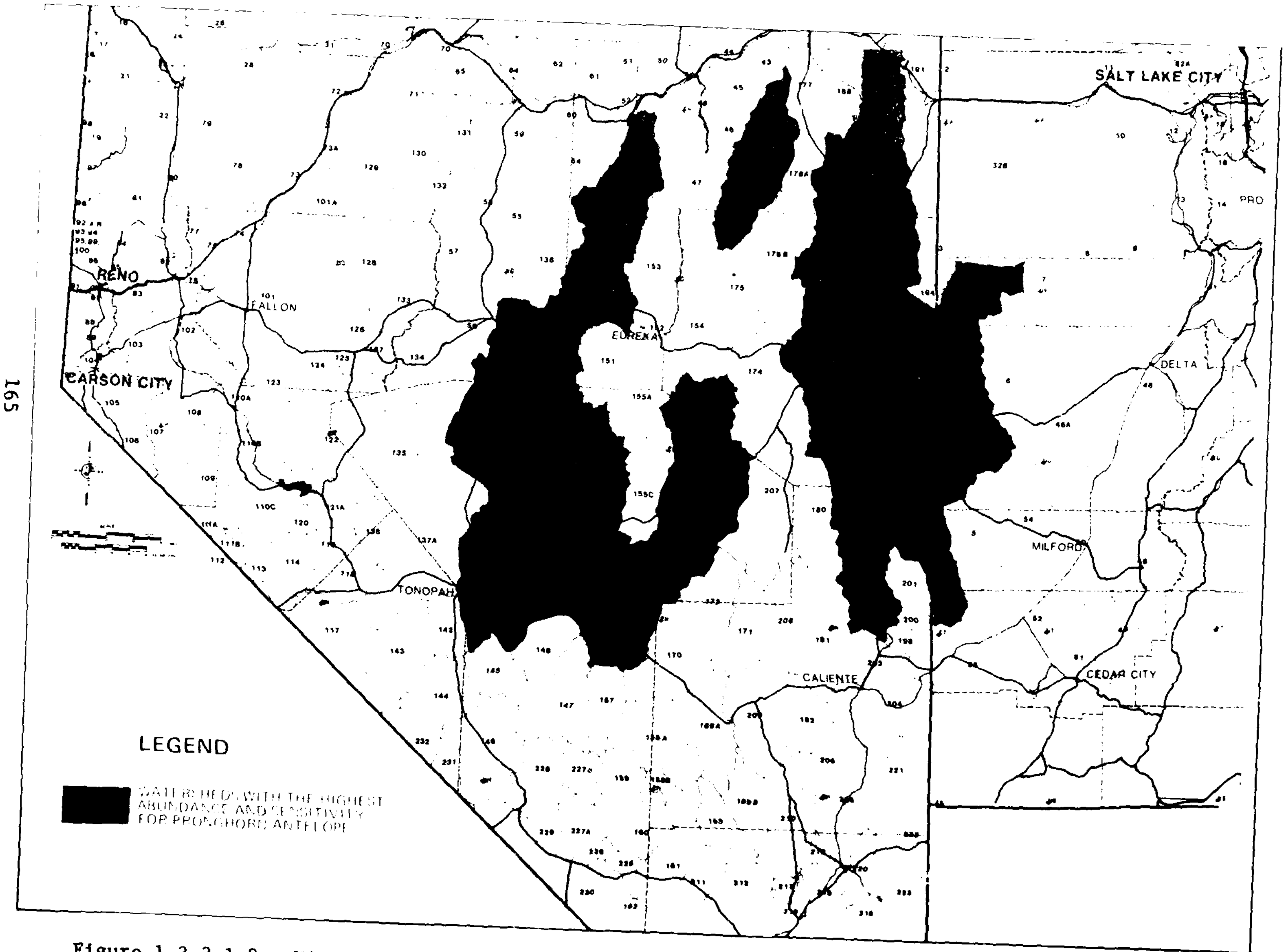

Figure 1.3.3.1-8. Highest abundance and sensitivity for pronghorn in the Nevada/Utah study area.

other species was also present in the hydrologic subunit, or if bighorn sheep abundance was rated intermediate and at least one other species was present. Abundance was considered intermediate if the state wildlife agency maps indicated that the hydrologic subunit contained elk and a low abundance of mule deer. Abundance was rated low if only one species of big game occurred in the hydrologic subunit and at low abundance, or if no species occurred in the hydrologic subunit. Figure 1.3.3.1-9 is a map of the ranked hydrologic subunits in the study area.

Sensitivity to impact was rated high if the hydrologic subunit contained bighorn or elk. Sensitivity was considered intermediate if the hydrologic subunit contained mule deer. The low sensitivity category was not used. Quality of data was considered high if either the state wildlife agency population estimates or mule deer range was defined well, as was the case in Nevada. Data quality was rated intermediate if the state wildlife agency provided no estimate of population or, as in Utah, mule deer range was poorly defined.

The following hydrologic subunits were rated high in resource abundance and high sensitivity to impact: Snake, Big Smoky-Tonopah Flat, Big Smoky-north, Monitor, Little Fish Lake, Tikaboo-northern, Garden, Railroad-northern, Ruby, Steptoe, Spring, Meadow Valley Wash, Kane Springs, White River, Pahranagat, and Coyote Springs. (See Figure 1.3.3.1-10, Hydrologic Subunits of highest abundance and sensitivity for other big game, for the location of these hydrologic subunits in the study area.) The siting of M-X project features in these watersheds would have the potential for the most damage to the other big game resource.

Abundance was considered high if more than 25 percent of the hydrologic subunit was occupied by sage grouse range. Abundance was intermediate if less than 25 percent of the hydrologic subunit had mapped range. Abundance was rated low if the watershed contained no mapped sage grouse range. These rankings are mapped in Figure 1.3.3.1-3.

Sensivitity to impact was rated intermediate if the hydrologic subunit contained mapped sage grouse range, and was considered low if the hydrologic subunit contained no mapped sage grouse range. The high level of sensitivity was not used because, although point locations such as strutting grounds are easily disturbed, sage grouse range in general is not.

Quality of data was rated high for those hydrologic subunits for which the Nevada Department of Wildlife provided a map of sage grouse range. These maps detailed the distribution of strutting grounds, brood use areas, and wintering grounds. Data quality was judged intermediate in those hydrologic subunits for which the Utah Department of Wildlife Resources provided a map of sage grouse range. These maps contained no more detailed distributions. The low category was not used.

The following hydrologic subunits were rated high in resource abundance and the highest sensitivity to impact: Rush, Huntington, Pine (Nevada), Carico Lake, Upper Reese River, Smith Creek, Big Smokey-north, Grass, Kobeh, Monitor, Little Fish Lake, Stevens, Diamond, Antelope, Newark, Little Smoky, Hot Creek, Garden, Jakes, Long, Ruby, Butte, Steptoe, Cave, Lake, Spring, Antelope, Hamlin, Goshute, Rose, Spring, Patterson, and White River. Figure 1.3.3.1-11 shows the location of these hydrologic subunits in the study area. The siting of M-X project features in

WATERSHEDS IN THE NEVADA/UTAH STUDY AREA

LEGEND

2 PILOT
4 SNAKE
5 PINE
6 WHITE
7 FISH SPRINGS
8 DUGWAY
9 GOVERNMENT CREEK
10 SKULL
11 SINK
12 TOOELE
13 RUSH
14 CEDAR
16 GOSHEN
17 PILGRIM FLAT
18 PAINTER FLAT
18 NORTHERN UTAH LAKE (UT)
19 DRY
19 JORDAN (UT)
21 SMOKE CREEK DESERT
22 SAN EMIDIO DESERT
23 GRANITE BASIN
24 HUALAPAI FLAT
26 MUD MEADOW
28 BLACK ROCK DESERT
31 DESERT
32A GREAT SALT LAKE DESERT LAKE
32B GREAT SALT LAKE DESERT WESTERN DESERT
43 STARR
44 NORTH FORK
45 LAMOILLE
46 SEVIER DESERT (UT)
46A SEVIER DESERT DRY LAKE (UT)
46 SOUTH FORK
47 HUNTINGTON
48 BEAVER (UT)
48 DIXIE CREEK TENMILE CREEK
49 PAROWAN (UT)
49 ELKO SEGMENT
50 MILFORD (UT)
50 SUSIE CREEK
51 MAGGIE CREEK
51 CEDAR CITY (UT)
52 MARYS CREEK
52 LUND DISTRICT (UT)
53 BERYL ENTERPRISE DISTRICT (UT)
53 PINE
54 WAH WAH (UT)
54 CRESCENT
55 CARICO LAKE
56 UPPER REESE RIVER
57 ANTELOPE
58 MIDDLE REESE RIVER
59 LOWER REESE RIVER
60 WHIRLWIND
61 BOULDER FLAT
62 ROCK CREEK
64 CLOVERS
65 PUMPERNICKEL
70 WINNEMUCCA SEGMENT
71 GRASS
72 IMLAY
73 LOVELOCK
73A LOVELOCK OREANA
74 WHITE PLAINS
75 BRADYS HOT SPRINGS
76 FERNLEY
77 FIREBALL
78 GRANITE SPRINGS
79 KUMIVA
80 WINNEMUCCA LAKE
81 PYRAMID LAKE
82 DODGE FLAT
83 TRACY SEGMENT
84 WARM SPRINGS
85 SPANISH SPRINGS
86 SUN
87 TRUCKEE MEADOWS
88 PLEASANT
89 WASHOE
90 LAKE TAHOE BASIN
91 TRUCKEE CANYON SEGMENT

92A LEMMON WESTERN
92B LEMMON EASTERN
93 ANTELOPE
94 BEDELL FLAT
95 DRY
96 NEWCOMB LAKE
97 HONEY LAKE
98 SKEDADDLE CREEK
99 RED ROCK
100 COLD SPRING
101 CARSON DESERT
101A CARSON DESERT PACKARD
102 CHURCHILL
103 DAYTON
104 EAGLE
105 CARSON
106 ANTELOPE
107 SMITH
108 MASON
109 EAST WALKER
110A WALKER LAKE SCHURZ
110B WALKER LAKE LAKE
110C WALKER LAKE WHISKEY FLAT HAWTHORNE
111A ALKALI (MINERAL) NORTHERN
111B ALKALI (MINERAL) SOUTHERN
112 MONO
113 HUNTOON
114 TEELS MARSH
117 FISH LAKE
118 COLUMBUS SALT MARSH
119 RHODES SALT MARSH
120 GARFIELD FLAT
121A SODA SPRING EASTERN
121B SODA SPRING WESTERN
122 GABBS
123 RAWHIDE FLATS
124 FAIRVIEW
125 STINGAREE
126 COWKICK
127 EASTGATE
128 DIXIE
129 BUENA VISTA
130 PLEASANT
131 BUFFALO
132 JERSEY
133 EDWARDS CREEK
136 MONTE CRISTO
137A BIG SMOKY TONOPAH FLAT
137B BIG SMOKY NORTH
138 GRASS
139 KOBEH
140A MONITOR NORTHERN
140B MONITOR SOUTHERN
141 RALSTON
142 ALKALI SPRING
143 CLAYTON
144 LIDA
145 STONEWALL FLAT
146 SCAROBATUS FLAT
147 GOLD FLAT
148 CACTUS FLAT
149 STONE CABIN
150 LITTLE FISH LAKE
151 ANTELOPE
152 STEVENS
153 DIAMOND
154 NEWARK
155A LITTLE SMOKY NORTHERN
155B LITTLE SMOKY CENTRAL
155C LITTLE SMOKY SOUTHERN
156 HOT CREEK
157 KAWICH
158A EMIGRANT GROOM LAKE
158B EMIGRANT PAPOOSE LAKE
159 YUCCA FLAT
160 FRENCHMAN FLAT
161 INDIAN SPRINGS
162 PAHRUMP
163 MESQUITE
168 THREE LAKES

169A TIKAPOO (TIKABOO) NORTHERN
169B TIKAPOO (TIKABOO) SOUTHERN
170 PENOYER
171 COAL
172 GARDEN
173A RAILROAD SOUTHERN
173B RAILROAD NORTHERN
174 JAKES
175 LONG
176 RUBY
177 CLOVER
178A BUTTE NORTH
178B BUTTE SOUTH
179 STEPTOE
180 CAVE
181 DRY LAKE
182 DELAMAR
183 LAKE
184 SPRING
185 TIPPETT
186A ANTELOPE (WHITE PINE AND ELKO) SOUTHERN
186B ANTELOPE (WHITE PINE AND ELKO) NORTHERN
187 GOSHUTE
188 INDEPENDENCE
191 PILOT CREEK
194 PLEASANT
196 HAMLIN
198 DRY
199 ROSE
200 EAGLE
201 SPRING
202 PATTERSON
203 PANACA
204 CLOVER
205 MEADOW WASH
206 KANE SPRINGS
207 WHITE RIVER
208 PAHROC
209 PAHRANAGAT
210 COYOTE SPRINGS
211 THREE LAKES
212 LAS VEGAS
215 BLACK MOUNTAINS
216 GARNET
217 HIDDEN NORTH
218 CALIFORNIA WASH
219 MUDDY RIVER SPRINGS
220 LOWER MOAPA
221 TULE DESERT
222 VIRGIN RIVER
223 GOLD BUTTE
224 GREASEWOOD BASIN
225 MERCURY
226 ROCK
227A FORTYMILE CANYON JACKASS FLATS
227B FORTYMILE CANYON BUCKBOARD MESA
228 OASIS
229 CRATER FLAT
230 AMARGOSA DESERT
231 GRAPEVINE CANYON
232 ORIENTAL WASH

1706-B

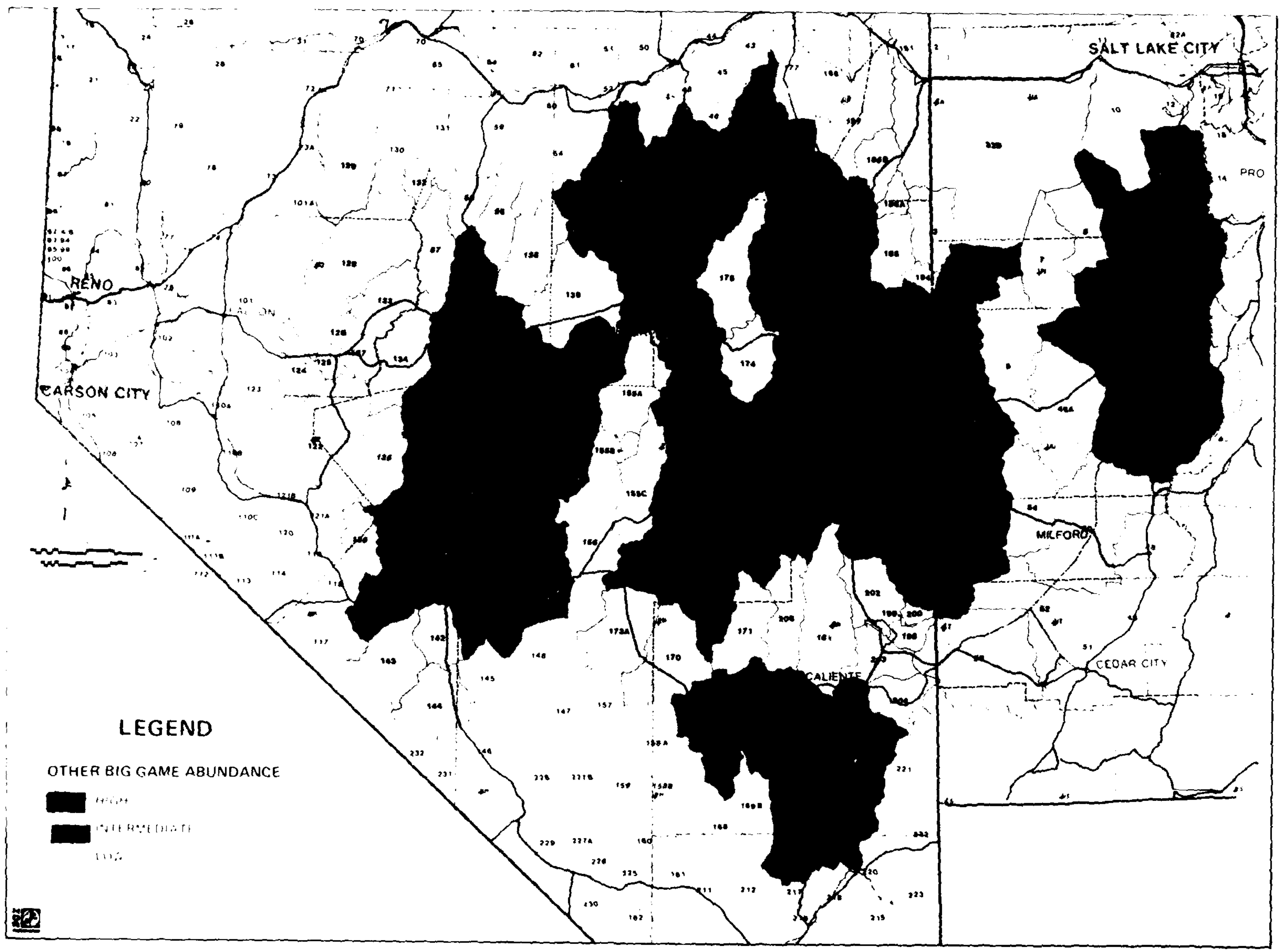

Figure 1.3.3.1-9. Big game abundance ranking for hydrologic subunits in the Nevada/Utah study area.

WATERSHEDS IN THE NEVADA/UTAH STUDY AREA

LEGEND

2	PILOT
4	SNAKE
5	PINE
6	WHITE
	FISH SPRINGS
6	DUGWAY
9	GOVERNMENT CREEK
10	SKULL
11	SINK
12	TOOELE
13	RUSH
14	CEDAR
16	GOSHEN
17	PILGRIM FLAT
18	PAINTER FLAT
18	NORTHERN UTAH LAKE (UT)
19	DRY
19	JORDAN (UT)
21	SMOKE CREEK DESERT
22	SAN EMIDIO DESERT
23	GRANITE BASIN
24	HUALAPAI FLAT
26	MUD MEADOW
28	BLACK ROCK DESERT
31	DESERT
32A	GREAT SALT LAKE DESERT (LAKE)
32B	GREAT SALT LAKE DESERT (WESTERN DESERT)
43	STARR
44	NORTH FORK
45	LAMOILLE
46	SEVIER DESERT (UT)
46A	SEVIER DESERT (DRY LAKE) (UT)
46	SOUTH FORK
47	HUNTINGTON
48	BEAVER (UT)
48	DIXIE CREEK (TENMILE CREEK)
49	PAROWAN (UT)
49	ELKO SEGMENT
50	MILFORD (UT)
50	SUSIE CREEK
51	MAGGIE CREEK
51	CEDAR CITY (UT)
52	MARYS CREEK
52	LUND DISTRICT (UT)
53	BERYL ENTERPRISE DISTRICT (UT)
53	PINE
54	WAH WAH (UT)
54	CRESCENT
55	CARICO LAKE
56	UPPER REESE RIVER
57	ANTELOPE
58	MIDDLE REESE RIVER
59	LOWER REESE RIVER
60	WHIRLWIND
61	BOULDER FLAT
62	ROCK CREEK
64	CLOVERS
65	PUMPERNICKEL
70	WINNEMUCCA SEGMENT
71	GRASS
72	IMLAY
73	LOVELOCK
73A	LOVELOCK (OREANA)
74	WHITE PLAINS
75	BRADYS HOT SPRINGS
76	FERNLEY
77	FIREBALL
78	GRANITE SPRINGS
79	KUMIVA
80	WINNEMUCCA LAKE
81	PYRAMID LAKE
82	DODGE FLAT
83	TRACY SEGMENT
84	WARM SPRINGS
85	SPANISH SPRINGS
86	SUN
87	TRUCKEE MEADOWS
88	PLEASANT
89	WASHOE
90	LAKE TAHOE BASIN
91	TRUCKEE CANYON SEGMENT
92A	LEMMON (WESTERN)
92B	LEMMON (EASTERN)
93	ANTELOPE
94	BEDELL FLAT
95	DRY
96	NEWCOMB LAKE
97	HONEY LAKE
98	SKEDADDLE CREEK
99	RED ROCK
100	COLD SPRING
101	CARSON DESERT
101A	CARSON DESERT (PACKARD)
102	CHURCHILL
103	DAYTON
104	EAGLE
105	CARSON
106	ANTELOPE
107	SMITH
108	MASON
109	EAST WALKER
110A	WALKER LAKE (SCHURZ)
110B	WALKER LAKE (LAKE)
110C	WALKER LAKE (WHISKEY FLAT, HAWTHORNE)
111A	ALKALI (MINERAL) (NORTHERN)
111B	ALKALI (MINERAL) (SOUTHERN)
112	MONO
113	HUNTOON
114	TEELS MARSH
117	FISH LAKE
118	COLUMBUS SALT MARSH
119	RHODES SALT MARSH
120	GARFIELD FLAT
121A	SODA SPRING (EASTERN)
121B	SODA SPRING (WESTERN)
122	GABBS
123	RAWHIDE FLATS
124	FAIRVIEW
125	STINGAREE
126	COWKICK
127	EASTGATE
128	DIXIE
129	BUENA VISTA
130	PLEASANT
131	BUFFALO
132	JERSEY
133	EDWARDS CREEK
136	MONTE CRISTO
137A	BIG SMOKY (TONOPAH FLAT)
137B	BIG SMOKY (NORTH)
138	GRASS
139	KOBEH
140A	MONITOR (NORTHERN)
140B	MONITOR (SOUTHERN)
141	RALSTON
142	ALKALI SPRING
143	CLAYTON
144	LIDA
145	STONEWALL FLAT
146	SARCOBATUS FLAT
147	GOLD FLAT
148	CACTUS FLAT
149	STONE CABIN
150	LITTLE FISH LAKE
151	ANTELOPE
152	STEVENS
153	DIAMOND
154	NEWARK
155A	LITTLE SMOKY (NORTHERN)
155B	LITTLE SMOKY (CENTRAL)
155C	LITTLE SMOKY (SOUTHERN)
156	HOT CREEK
157	KAWICH
158A	EMIGRANT (GROOM LAKE)
158B	EMIGRANT (PAPOOSE LAKE)
159	YUCCA FLAT
160	FRENCHMAN FLAT
161	INDIAN SPRINGS
162	PAHRUMP
163	MESQUITE
168	THREE LAKES
169A	TIKAPOO (TIKABOO) (NORTHERN)
169B	TIKAPOO (TIKABOO) (SOUTHERN)
170	PENOYER
171	COAL
172	GARDEN
173A	RAILROAD (SOUTHERN)
173B	RAILROAD (NORTHERN)
174	JAKES
175	LONG
176	RUBY
177	CLOVER
178A	BUTTE (NORTH)
178B	BUTTE (SOUTH)
179	STEPTOE
180	CAVE
181	DRY LAKE
182	DELAMAR
183	LAKE
184	SPRING
185	TIPPETT
186A	ANTELOPE (WHITE PINE AND ELKO) SOUTHERN
186B	ANTELOPE (WHITE PINE AND ELKO) NORTHERN
187	GOSHUTE
188	INDEPENDENCE
191	PILOT CREEK
194	PLEASANT
196	HAMLIN
198	DRY
199	ROSE
200	EAGLE
201	SPRING
202	PATTERSON
203	PANACA
204	CLOVER
205	MEADOW WASH
206	KANE SPRINGS
207	WHITE RIVER
208	PAHROC
209	PAHRANAGAT
210	COYOTE SPRINGS
211	THREE LAKES
212	LAS VEGAS
215	BLACK MOUNTAINS
216	GARNET
217	HIDDEN (NORTH)
218	CALIFORNIA WASH
219	MUDDY RIVER SPRINGS
220	LOWER MOAPA
221	TULE DESERT
222	VIRGIN RIVER
223	GOLD BUTTE
224	GREASEWOOD BASIN
225	MERCURY
226	ROCK
227A	FORTYMILE CANYON (JACKASS FLATS)
227B	FORTYMILE CANYON (BUCKBOARD MESA)
228	OASIS
229	CRATER FLAT
230	AMARGOSA DESERT
231	GRAPEVINE CANYON
232	ORIENTAL WASH

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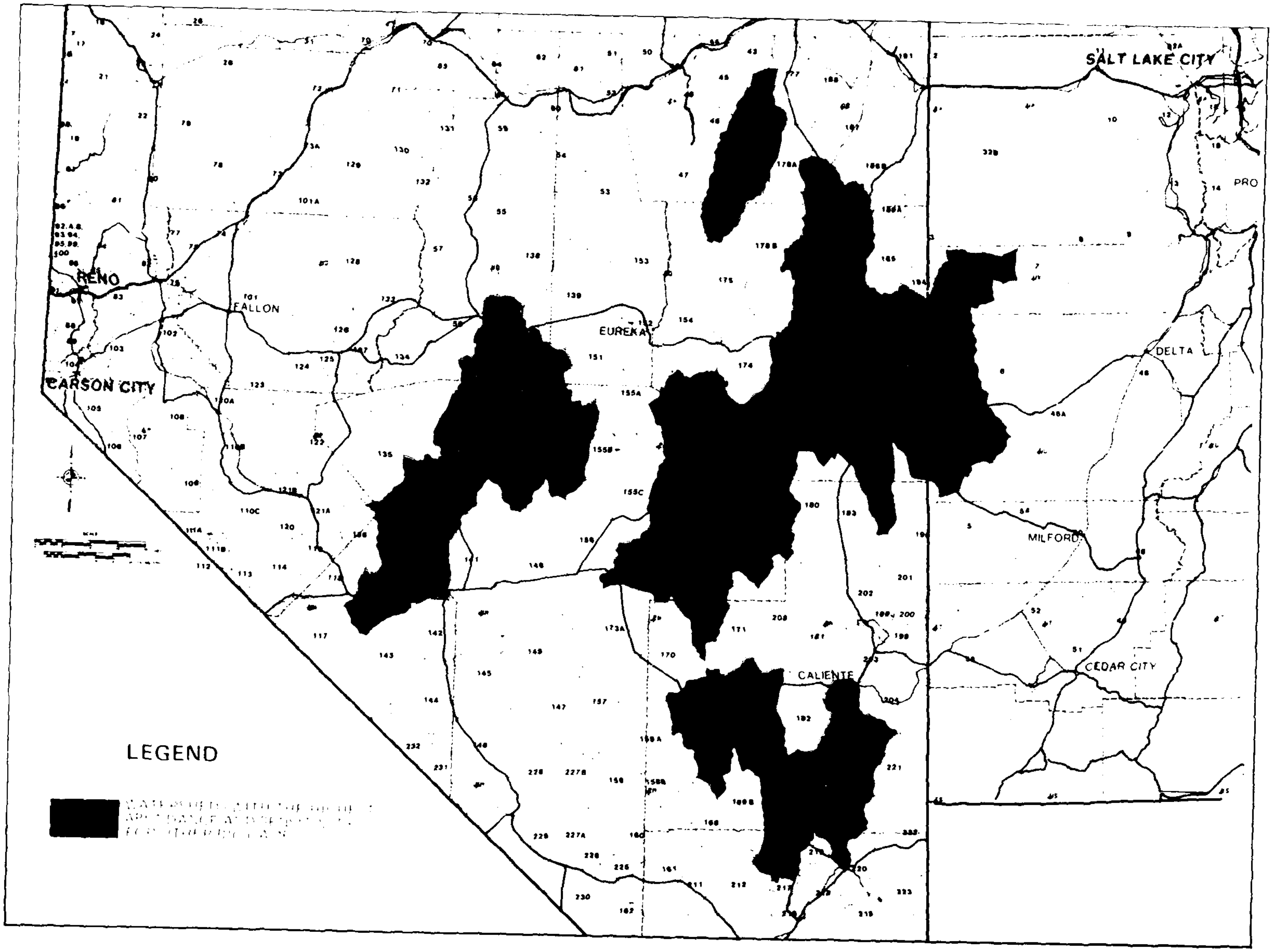

Figure 1.3.3.1-10. Highest abundance and sensitivity for bug game in the Nevada/Utah study area.

WATERSHEDS IN THE NEVADA/UTAH STUDY AREA

LEGEND

2 PILOT
4 SNAKE
5 PINE
6 WHITE
7 FISH SPRINGS
8 DUGWAY
9 GOVERNMENT CREEK
10 SKULL
11 SINK
12 TOOELE
13 RUSH
14 CEDAR
16 GOSHEN
17 PILGRIM FLAT
18 PAINTER FLAT
18 NORTHERN UTAH LAKE (UT)
19 DRY
19 JORDAN (UT)
21 SMOKE CREEK DESERT
22 SAN EMIDIO DESERT
23 GRANITE BASIN
24 HUALAPAI FLAT
26 MUD MEADOW
28 BLACK ROCK DESERT
31 DESERT
32A GREAT SALT LAKE DESERT (LAKE)
32B GREAT SALT LAKE DESERT (WESTERN DESERT)
43 STARR
44 NORTH FORK
45 LAMOILLE
46 SEVIER DESERT (UT)
46A SEVIER DESERT (DRY LAKE) (UT)
46 SOUTH FORK
47 HUNTINGTON
48 BEAVER (UT)
48 DIXIE CREEK - TENMILE CREEK
48 PAROWAN (UT)
49 ELKO SEGMENT
50 MILFORD (UT)
50 SUSIE CREEK
51 MAGGIE CREEK
51 CEDAR CITY (UT)
52 MARYS CREEK
52 LUND DISTRICT (UT)
53 BERYL ENTERPRISE DISTRICT (UT)
53 PINE
54 WAH WAH (UT)
54 CRESCENT
55 CARICO LAKE
56 UPPER REESE RIVER
57 ANTELOPE
58 MIDDLE REESE RIVER
59 LOWER REESE RIVER
60 WHIRLWIND
61 BOULDER FLAT
62 ROCK CREEK
64 CLOVERS
65 PUMPERNICKEL
70 WINNEMUCCA SEGMENT
71 GRASS
72 IMLAY
73 LOVELOCK
73A LOVELOCK - OREANA
74 WHITE PLAINS
75 BRADYS HOT SPRINGS
76 FERNLEY
77 FIREBALL
78 GRANITE SPRINGS
79 KUMIVA
80 WINNEMUCCA LAKE
81 PYRAMID LAKE
82 DODGE FLAT
83 TRACY SEGMENT
84 WARM SPRINGS
85 SPANISH SPRINGS
86 SUN
87 TRUCKEE MEADOWS
88 PLEASANT
89 WASHOE
90 LAKE TAHOE BASIN
91 TRUCKEE CANYON SEGMENT

92A LEMMON - WESTERN
92B LEMMON - EASTERN
93 ANTELOPE
94 BEDELL FLAT
95 DRY
96 NEWCOMB LAKE
97 HONEY LAKE
98 SKEDADDLE CREEK
99 RED ROCK
100 COLD SPRING
101 CARSON DESERT
101A CARSON DESERT - PACKARD
102 CHURCHILL
103 DAYTON
104 EAGLE
105 CARSON
106 ANTELOPE
107 SMITH
108 MASON
109 EAST WALKER
110A WALKER LAKE - SCHURZ
110B WALKER LAKE - LAKE
110C WALKER LAKE - WHISKEY FLAT - HAWTHORNE
111A ALKALI - MINERAL - NORTHERN
111B ALKALI - MINERAL - SOUTHERN
112 MONO
113 HUNTOON
114 TEELS MARSH
117 FISH LAKE
118 COLUMBUS SALT MARSH
119 RHODES SALT MARSH
120 GARFIELD FLAT
121A SODA SPRING - EASTERN
121B SODA SPRING - WESTERN
122 GABBS
123 RAWHIDE FLATS
124 FAIRVIEW
125 STINGAREE
126 COWKICK
127 EASTGATE
128 DIXIE
129 BUENA VISTA
130 PLEASANT
131 BUFFALO
132 JERSEY
133 EDWARDS CREEK
136 MONTE CRISTO
137A BIG SMOKY - TONOPAH FLAT
137B BIG SMOKY - NORTH
138 GRASS
139 KOBEH
140A MONITOR - NORTHERN
140B MONITOR - SOUTHERN
141 RALSTON
142 ALKALI SPRING
143 CLAYTON
144 LIDA
145 STONEWALL FLAT
146 SARCOBATUS FLAT
147 GOLD FLAT
148 CACTUS FLAT
149 STONE CABIN
150 LITTLE FISH LAKE
151 ANTELOPE
152 STEVENS
153 DIAMOND
154 NEWARK
155A LITTLE SMOKY - NORTHERN
155B LITTLE SMOKY - CENTRAL
155C LITTLE SMOKY - SOUTHERN
156 HOT CREEK
157 KAWICH
158A EMIGRANT - GROOM LAKE
158B EMIGRANT - PAPOOSE LAKE
159 YUCCA FLAT
160 FRENCHMAN FLAT
161 INDIAN SPRINGS
162 PAHRUMP
163 MESQUITE
168 THREE LAKES

169A TIKAPOO (TIKABOO) - NORTHERN
169B TIKAPOO (TIKABOO) - SOUTHERN
170 PENOYER
171 COAL
172 GARDEN
173A RAILROAD - SOUTHERN
173B RAILROAD - NORTHERN
174 JAKES
175 LONG
176 RUBY
177 CLOVER
178A BUTTE - NORTH
178B BUTTE - SOUTH
179 STEPTOE
180 CAVE
181 DRY LAKE
182 DELAMAR
183 LAKE
184 SPRING
185 TIPPETT
186A ANTELOPE (WHITE PINE AND ELKO) - SOUTHERN
186B ANTELOPE (WHITE PINE AND ELKO) - NORTHERN
187 GOSHUTE
188 INDEPENDENCE
191 PILOT CREEK
194 PLEASANT
195 HAMLIN
198 DRY
199 ROSE
200 EAGLE
201 SPRING
202 PATTERSON
203 PANACA
204 CLOVER
205 MEADOW WASH
206 KANE SPRINGS
207 WHITE RIVER
208 PAHROC
209 PAHRANAGAT
210 COYOTE SPRINGS
211 THREE LAKES
212 LAS VEGAS
215 BLACK MOUNTAINS
216 GARNET
217 HIDDEN - NORTH
218 CALIFORNIA WASH
219 MUDDY RIVER SPRINGS
220 LOWER MOAPA
221 TULE DESERT
222 VIRGIN RIVER
223 GOLD BUTTE
224 GREASEWOOD BASIN
225 MERCURY
226 ROCK
227A FORTYMILE CANYON - JACKASS FLATS
227B FORTYMILE CANYON - BUCKBOARD MESA
228 OASIS
229 CRATER FLAT
230 AMARGOSA DESERT
231 GRAPEVINE CANYON
232 ORIENTAL WASH

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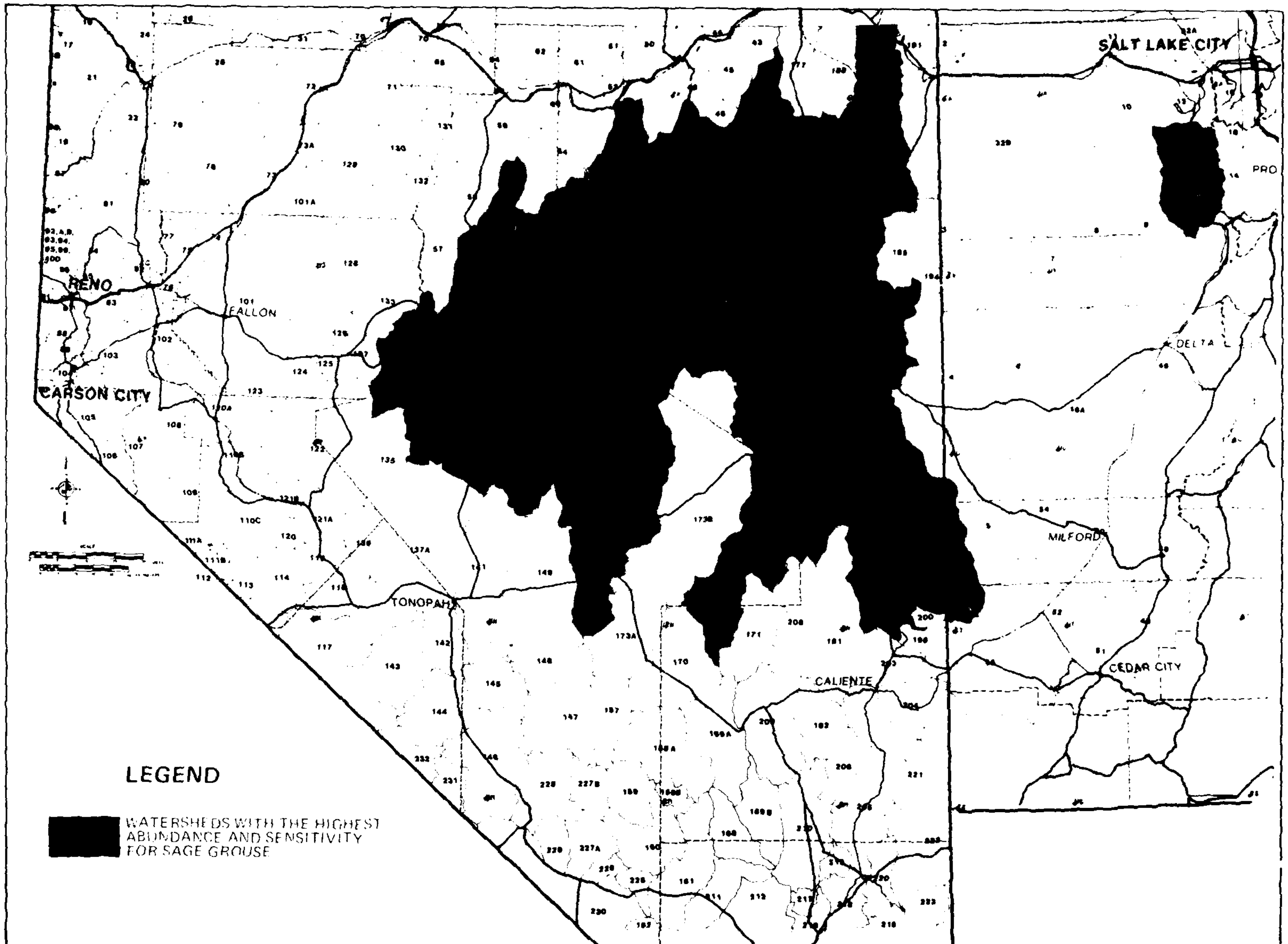

Figure 1.3.3.1-11. Highest abundance and sensitivity for sage grouse in the Nevada/Utah study area.

these hydrologic subunits would have the potential for the most damage for the sage grouse resource.

Abundance was considered high if either (a) chukar were rated abundant and any other species occurred in the hydrologic subunit, or (b) chukar were rated of intermediate abundance and two other species occurred in the hydrologic subunit. Abundance was rated intermediate if either (a) the hydrologic subunit contained chukar and was in Utah, (b) the hydrologic subunit contained high numbers of chukar and no other species, (c) the hydrologic subunit contained intermediate numbers of chukar and no other species, (d) the hydrologic subunit contained intermediate numbers of chukar and one other species, (e) the hydrologic subunit contained low numbers of chukar and any other species, and (f) the hydrologic subunit contained any single species other than chukar. Abundance was considered low if the hydrologic subunit contained either (a) only low numbers of chukar, or (b) no species. The ranked hydrologic subunits are mapped in Figure 1.3.3.1-12.

Sensitivity to impact was rated low for all upland game birds. The high and intermediate categories were not used. Quality of data was rated intermediate if the data came from Nevada, because Nevada provided numerical estimates of abundance for chukar but not for quail or grouse. Quality of data was rated low in Utah because Utah provided no estimate of abundance for any species. The high quality category was not used.

The following hydrologic subunits were rated high in resource abundance and the highest sensitivity to impact: Snake, Huntington, Pine, Crescent, Upper Reese River, Big Smoky-Tonopah Flat, Little Fish Lake. See Figure 1.3.3.1-13, Watersheds of highest abundance and sensitivity for other upland game, for the location of these hydrologic subunits in the study area. The siting of M-X project features in these hydrologic subunits would have the potential for the most damage to the other upland game resource.

General Impacts - Texas/New Mexico (1.3.3.2)

Effects Common to Many Species

Impacts arising directly from project construction and operation will result from habitat loss, vehicle collisions with animals, establishment of transmission lines, and radar and microwave emissions (Table 1.3.3.2-1). Wildlife habitat loss will result from construction of shelters, roads, construction camps, and gravel pits. Around each shelter, approximately 7.5 acres of vegetation will be disturbed. Road building will remove vegetation within 50 ft (15 m) on either side of the roadway. Small animals such as snakes, lizards, and rodents, whose entire home range may be within a single cleared area, are likely to perish. Removal of natural vegetation initially will reduce or eliminate carrying capacity for small and large herbivores. Carnivores will be reduced in number through removal of foraging and breeding areas, and through reduction of prey density. However, effective revegetation could restore or even enhance the habitat (USFWS, 1978).

Groundwater use is expected to have little direct impact on terrestrial wildlife on the Texas/New Mexico High Plains. None of the existing aquatic habitats depend on groundwater for recharge. In some cases, redirected water runoff from construction projects may supplement existing surface water habitat. Supple-

WATERSHEDS IN THE NEVADA/UTAH STUDY AREA

LEGEND

2	PILOT
4	SNAKE
5	PINE
6	WHITE
7	FISH SPRINGS
8	DUGWAY
9	GOVERNMENT CREEK
10	SKULL
11	SINK
12	TOOELE
13	RUSH
14	CEDAR
16	GOSHEN
17	PILGRIM FLAT
18	PAINTER FLAT
18	NORTHERN UTAH LAKE (UT)
19	DRY
19	JORDAN (UT)
21	SMOKE CREEK DESERT
22	SAN EMIDIO DESERT
23	GRANITE BASIN
24	HUALAPAI FLAT
26	MUD MEADOW
28	BLACK ROCK DESERT
31	DESERT
32A	GREAT SALT LAKE DESERT (LAKE)
32B	GREAT SALT LAKE DESERT WESTERN DESERT
43	STARR
44	NORTH FORK
45	LAMOILLE
46	SEVIER DESERT (UT)
46A	SEVIER DESERT DRY LAKE (UT)
46	SOUTH FORK
47	HUNTINGTON
48	BEAVER (UT)
48	DIXIE CREEK TENMILE CREEK
49	PAROWAN (UT)
49	ELKO SEGMENT
50	MILFORD (UT)
50	SUSIE CREEK
51	MAGGIE CREEK
51	CEDAR CITY (UT)
52	MARYS CREEK
52	LUND DISTRICT (UT)
53	BERYL ENTERPRISE DISTRICT (UT)
53	PINE
54	WAH WAH (UT)
54	CRESCENT
55	CARICO LAKE
56	UPPER REESE RIVER
57	ANTELOPE
58	MIDDLE REESE RIVER
59	LOWER REESE RIVER
60	WHIRLWIND
61	BOULDER FLAT
62	ROCK CREEK
64	CLOVERS
65	PUMPERNICKEL
70	WINNEMUCCA SEGMENT
71	GRASS
72	IMLAY
73	LOVELOCK
73A	LOVELOCK OREANA
74	WHITE PLAINS
75	BRADYS HOT SPRINGS
76	FERNLEY
77	FIREBALL
78	GRANITE SPRINGS
79	KUMIVA
80	WINNEMUCCA LAKE
81	PYRAMID LAKE
82	DODGE FLAT
83	TRACY SEGMENT
84	WARM SPRINGS
85	SPANISH SPRINGS
86	SUN
87	TRUCKEE MEADOWS
88	PLEASANT
89	WASHOE
90	LAKE TAHOE BASIN
91	TRUCKEE CANYON SEGMENT
92A	LEMMON WESTERN
92B	LEMMON EASTERN
93	ANTELOPE
94	BEDELL FLAT
95	DRY
96	NEWCOMB LAKE
97	HONEY LAKE
98	SKEDADDLE CREEK
99	RED ROCK
100	COLD SPRING
101	CARSON DESERT
101A	CARSON DESERT PACKARD
102	CHURCHILL
103	DAYTON
104	EAGLE
105	CARSON
106	ANTELOPE
107	SMITH
108	MASON
109	EAST WALKER
110A	WALKER LAKE SCHURZ
110B	WALKER LAKE LAKE
110C	WALKER LAKE WHISKEY FLAT HAWTHORNE
111A	ALKALI (MINERAL) NORTHERN
111B	ALKALI (MINERAL) SOUTHERN
112	MONO
113	HUNTOON
114	TEELS MARSH
117	FISH LAKE
118	COLUMBUS SALT MARSH
119	RHODES SALT MARSH
120	GARFIELD FLAT
121A	SODA SPRING EASTERN
121B	SODA SPRING WESTERN
122	GABBS
123	RAWHIDE FLATS
124	FAIRVIEW
125	STINGAREE
126	COWKICK
127	EASTGATE
128	DIXIE
129	BUENA VISTA
130	PLEASANT
131	BUFFALO
132	JERSEY
133	EDWARDS CREEK
136	MONTE CRISTO
137A	BIG SMOKY TONOPAH FLAT
137B	BIG SMOKY NORTH
138	GRASS
139	KOBEH
140A	MONITOR NORTHERN
140B	MONITOR SOUTHERN
141	RALSTON
142	ALKALI SPRING
143	CLAYTON
144	LIDA
145	STONEWALL FLAT
146	SCAROBATUS FLAT
147	GOLD FLAT
148	CACTUS FLAT
149	STONE CABIN
150	LITTLE FISH LAKE
151	ANTELOPE
152	STEVENS
153	DIAMOND
154	NEWARK
155A	LITTLE SMOKY NORTHERN
155B	LITTLE SMOKY CENTRAL
155C	LITTLE SMOKY SOUTHERN
156	HOT CREEK
157	KAWICH
158A	EMIGRANT GROOM LAKE
158B	EMIGRANT PAPOOSE LAKE
159	YUCCA FLAT
160	FRENCHMAN FLAT
161	INDIAN SPRINGS
162	PAHRUMP
163	MESQUITE
168	THREE LAKES
169A	TIKAPOO (TIKABOO) NORTHERN
169B	TIKAPOO (TIKABOO) SOUTHERN
170	PENOYER
171	COAL
172	GARDEN
173A	RAILROAD SOUTHERN
173B	RAILROAD NORTHERN
174	JAKES
175	LONG
176	RUBY
177	CLOVER
178A	BUTTE NORTH
178B	BUTTE SOUTH
179	STEPTOE
180	CAVE
181	DRY LAKE
182	DELAMAR
183	LAKE
184	SPRING
185	TIPPETT
186A	ANTELOPE (WHITE PINE AND ELKO) SOUTHERN
186B	ANTELOPE (WHITE PINE AND ELKO) NORTHERN
187	GOSHUTE
188	INDEPENDENCE
191	PILOT CREEK
194	PLEASANT
196	HAMLIN
198	DRY
199	ROSE
200	EAGLE
201	SPRING
202	PATTERSON
203	PANACA
204	CLOVER
205	MEADOW WASH
206	KANE SPRINGS
207	WHITE RIVER
208	PAHROC
209	PAHRANAGAT
210	COYOTE SPRINGS
211	THREE LAKES
212	LAS VEGAS
215	BLACK MOUNTAINS
216	GARNET
217	HIDDEN NORTH
218	CALIFORNIA WASH
219	MUDDY RIVER SPRINGS
220	LOWER MOAPA
221	TULE DESERT
222	VIRGIN RIVER
223	GOLD BUTTE
224	GREASEWOOD BASIN
225	MERCURY
226	ROCK
227A	FORTYMILE CANYON JACKASS FLATS
227B	FORTYMILE CANYON BUCKBOARD MESA
228	OASIS
229	CRATER FLAT
230	AMARGOSA DESERT
231	GRAPEVINE CANYON
232	ORIENTAL WASH

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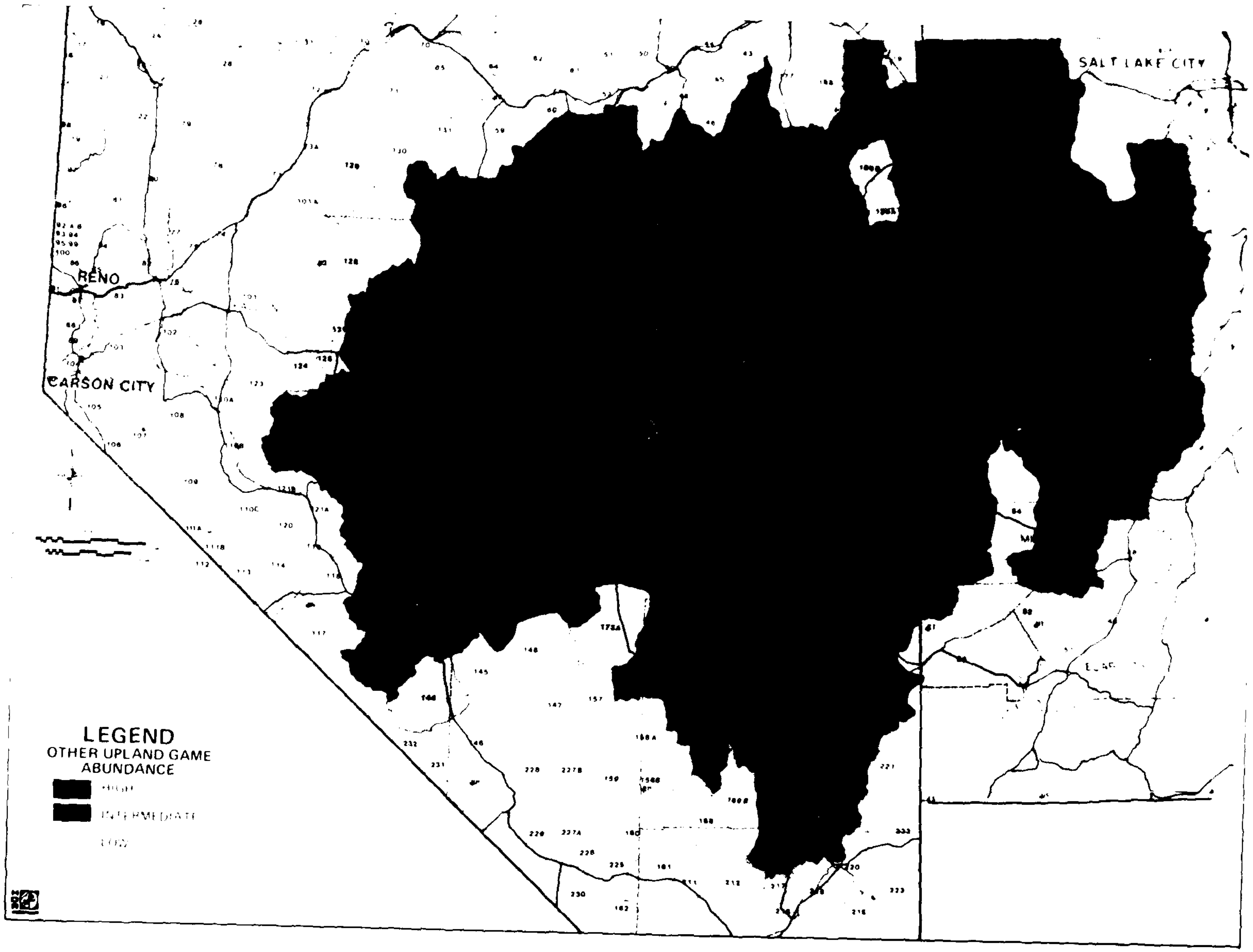

Figure 1.3.3.1-12. Other upland game (chukar, quail, and blue grouse) abundance in Nevada/Utah.

WATERSHEDS IN THE
NEVADA UTAH STUDY AREA

LEGEND

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[illegible]
[illegible] RUSH VALLEY
[illegible]
[illegible] MUD MEADOW
[illegible]
[illegible] DESERT
32A GREAT SALT LAKE DESERT [illegible]
32B GREAT SALT LAKE DESERT WESTERN POINT
43 STARR
44 NORTH [illegible]
45 SAMPLE
46 SEVIER DESERT UT
46A SEVIER DESERT DRY LAKE UT
46 SOUTH FORK
47 HUNTINGTON
48 BEAVER UT
48 DIXIE CREEK TENMILE CREEK
49 PAHORAN UT
49 ELKO SEGMENT
50 MILFORD UT
50 SUSIE CREEK
51 MAGGIE CREEK
51 CEDAR CITY UT
52 MARYS CREEK
52 LUND DISTRICT UT
53 BERYL ENTERPRISE DISTRICT UT
53 PINE
54 WAH WAH UT
54 CRESCENT
56 CARICO LAKE
56 UPPER REESE RIVER
57 ANTELOPE
58 MIDDLE REESE RIVER
59 LOWER REESE RIVER
60 WHIRLWIND
61 BOULDER FLAT
62 ROCK CREEK
64 CLOVERS
65 PUMPERNICKEL
70 WINNEMUCCA SEGMENT
71 GRASS
72 IMLAY
73 LOVELOCK
73A LOVELOCK ORLEANA
74 WHITE PLAINS
75 BRADYS HOT SPRINGS
76 FERNLEY
77 FIREBALL
78 GRANITE SPRINGS
79 KUMIVA
80 WINNEMUCCA LAKE
81 PYRAMID LAKE
82 DODGE FLAT
83 TRACY SEGMENT
84 WARM SPRINGS
85 SPANISH SPRINGS
86 SUN
87 TRUCKEE MEADOWS
88 PLEASANT
89 WASHOE
90 LAKE TAHOE BASIN
91 TRUCKEE CANYON SEGMENT

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108 MASON
109 EAST WALKER
110A WALKER LAKE [illegible]
110B WALKER LAKE [illegible]
110C WALKER LAKE [illegible]
111A ALKALI MINERAL NORTHERN
111B ALKALI MINERAL SOUTHERN
112 MONO
113 HUNTOON
114 TEELS MARSH
117 FISH LAKE
118 COLUMBUS SALT MARSH
119 RHODES SALT MARSH
120 GARFIELD FLAT
121A SODA SPRING EASTERN
121B SODA SPRING WESTERN
122 GABBS
123 RAWHIDE FLAT
124 FAIRVIEW
125 STINGAREE
126 COWKICK
127 EASTGATE
128 DIXIE
129 BUENA VISTA
130 PLEASANT
131 BUFFALO
132 JERSEY
133 EDWARDS CREEK
136 MONTE CRISTO
137A BIG SMOKY TONOPAH FLAT
137B BIG SMOKY NORTH
138 GRASS
139 KOBEH
140A MONITOR NORTHERN
140B MONITOR SOUTHERN
141 RALSTON
142 ALKALI SPRING
143 CLAYTON
144 LIDA
145 STONEWALL FLAT
146 SARCOBATUS FLAT
147 GOLD FLAT
148 CACTUS FLAT
149 STONE CABIN
150 LITTLE FISH LAKE
151 ANTELOPE
152 STEVENS
153 DIAMOND
154 NEWARK
155A LITTLE SMOKY NORTHERN
155B LITTLE SMOKY CENTRAL
155C LITTLE SMOKY SOUTHERN
156 HOT CREEK
157 KAWICH
158A EMIGRANT GROOM LAKE
158B EMIGRANT PAPOOSE LAKE
159 YUCCA FLAT
160 FRENCHMAN FLAT
161 INDIAN SPRINGS
162 PAHRUMP
163 MESQUITE
164 THREE LAKES

169A [illegible] NORTHERN
169B [illegible] SOUTHERN
170 PENOYER
171 COAL
172 GARDEN
173A RAILROAD [illegible]
173B RAILROAD [illegible]
174 JAKES
175 LONG
176 RUBY
177 [illegible]
178A BUTTE NORTH
178B BUTTE SOUTH
179 STEPTOE
180 CAVE
181 DRY LAKE
182 DELAMAR
183 LAKE
184 SPRING
185 TIPPETT
186A ANTELOPE [illegible] SOUTHERN
186B ANTELOPE [illegible] NORTHERN
187 GOSHUTE
188 INDEPENDENCE
191 PILOT CREEK
194 PLEASANT
196 HAMLIN
198 DRY
199 ROSE
200 EAGLE
201 SPRING
202 PATTERSON
203 PANACA
204 CLOVER
205 MEADOW WASH
206 KANE SPRINGS
207 WHITE RIVER
208 PAHROC
209 PAHRANAGAT
210 COYOTE SPRINGS
211 THREE LAKES
212 LAS VEGAS
215 BLACK MOUNTAINS
216 GARNET
217 HIDDEN NORTH
218 CALIFORNIA WASH
219 MUDDY RIVER SPRINGS
220 LOWER MOAPA
221 TULE DESERT
222 VIRGIN RIVER
223 GOLD BUTTE
224 GREASEWOOD BASIN
225 MERCURY
226 ROCK
227A FORTYMILE CANYON JACKASS FLATS
227B FORTYMILE CANYON BUCKBOARD MESA
228 OASIS
229 CRATER FLAT
230 AMARGOSA DESERT
231 GRAPEVINE CANYON
232 ORIENTAL WASH

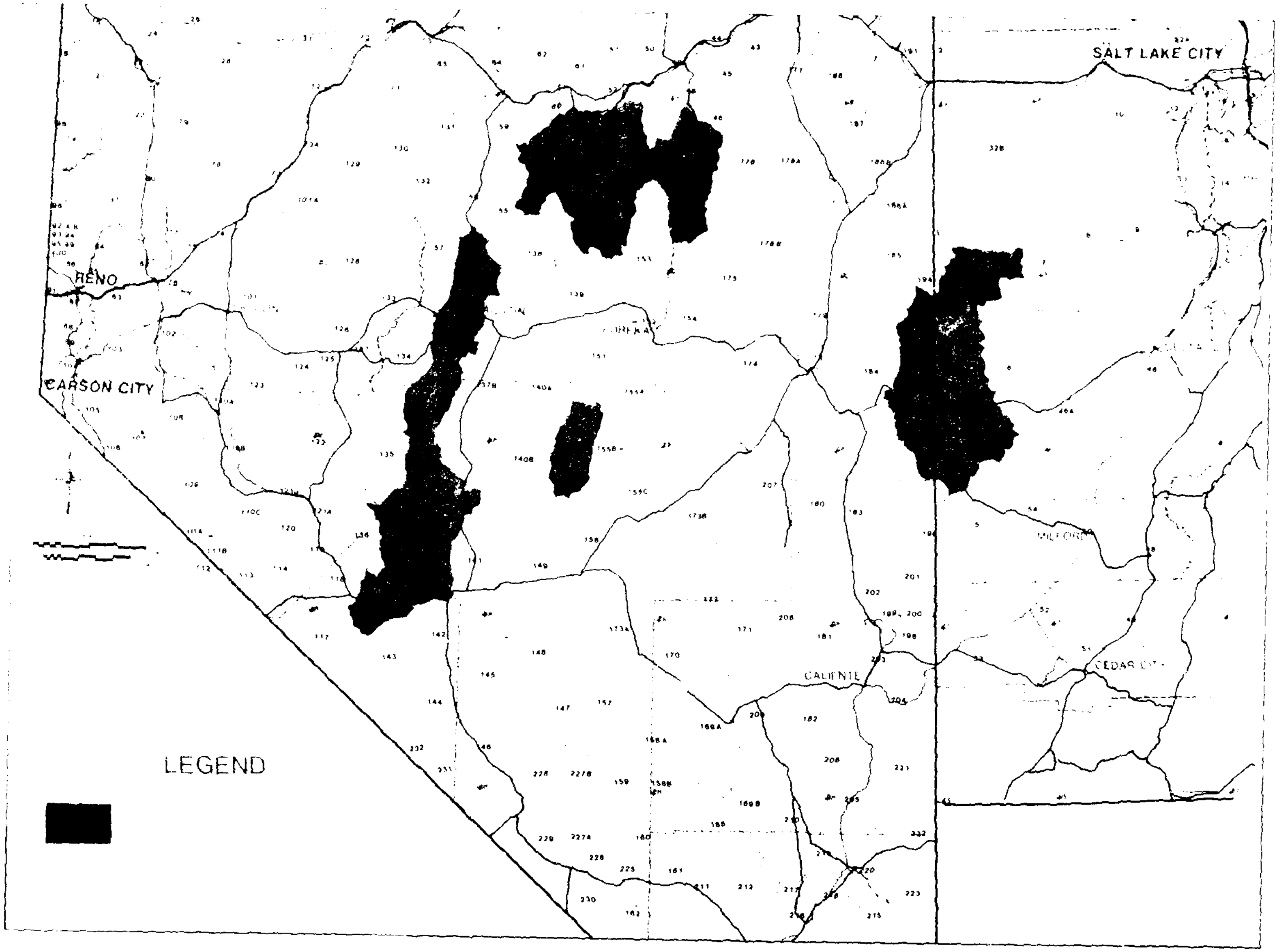

Figure 1.3.3.1-13. Highest abundance and sensitivity for other upland game in Nevada/Utah.

Table 1.3.3.2-1. Summary of potential impacts to wildlife in the Texas/New Mexico study area (page 1 of 4).

PROJECT PARAMETER	SECONDARY EFFECTS	POTENTIAL IMPACTS					
		FURBEARERS	REFERENCES	WATERFOWL	REFERENCES	COMMON/TYPICAL	REFERENCES
People Construction 48,108 (peak)	Sewage	Minimal impact expected		Lagooning of waste-water may provide resting sites. Data insufficient to predict effects on populations.		New water sources may provide habitat for aquatic species or those dependant on water-related vegetation.	
	Solid waste	Some species, such as skunks and racoons may be attracted to disposal sites. Data insufficient to quantify effects.		Minimal impacts to population		Some species may be attracted to disposal sites, such as rats, ravens, house mice, and some types of snakes. Those attracted may displace native species in vicinity of sites. Data insufficient to quantify effects.	DeBoer, et al, 1974 Davidson, et al., 1971
	Introduction of exotic species	Dogs and cats may harass or kill some furbearers. Competition may displace others. Data insufficient to quantify effects on populations.	Denny, 1974.	Dogs may harass and kill waterfowl. Data insufficient to quantify effects on populations.	Denny, 1974	Dogs and cats may harass or kill some species. Other exotic species, e.g. sparrows and starlings, associated with community development may displace native species. Data insufficient to quantify effects.	McNight, 1964; Emlen, 1974; Christian 1974
Operations (direct labor) 41,642 (peak) Induced growth = 33,303 (peak) Peak est. population = 101,529 Final est. population = 51,811 During construction, people will be dispersed throughout deployment area. During operations, people and effects will be concentrated in the vicinity of operating bases.	Recreation ORV use	Change in vegetation resulting from soil disturbance may affect furbearers through loss of cover or prey items. Many species may avoid ORV use areas; and some may be run over by ORVs. Data insufficient to quantify effects on populations.	Luckenbach & Bury, 1978	Minimal effects expected. ORV use at water areas such as streams and playa lakes could degrade quality of areas for waterfowl.		Changes in vegetation resulting from soil disturbance may cause loss of cover and food. Noise may cause avoidance by some species, loss of hearing which may increase. Susceptability to predation and premature emergence of spadefoot toads leading to death. Some species may be run over.	Bury, et al, 1977; Byrne, 1973; Luckenbach 1978; Brattstrom & Bondello 1980
	Camping, hiking, etc.	Some species (bobcat) may avoid areas of human activity while others (kit fox) may not. Data insufficient to predict effects	Egoscue 1962.	Data insufficient to predict effects.		Minimal effects expected.	
	Hunting	Increased hunting pressure proportional to increased number of people. May require changes in management policy such as reduced bag limits or seasons to maintain population levels.		Increased hunting pressure proportional to increased number May require changes in management policy such as reduced bag limits or seasons to maintain population levels and satisfy hunter demand.		No effects expected.	
	Poaching	Poaching likely for most species. Decline in coyote populations may be perceived as beneficial. Data insufficient to quantify effects.		Data insufficient to predict effects, but poaching likely		Many species may be poached, particularly during constrution. Effects on populations expected to be minimal	

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Table 1.3.3.2-1. Summary of potential impacts to wildlife in the Texas/ New Mexico study area (page ? of 4).

PROJECT PARAMETER	SECONDARY TYPE	POTENTIAL IMPACTS					
		BEARERS	REFERENCES	WATERFOWL	REFERENCES	COMMON TYPICAL	REFERENCES
	Construction						
Area disturbed 121,93? A (49,3?2 ha) for DTN. Cluster roads and clusters may be up to twice this for all roads and construction protective structure = 7.5 A structure road = 100 ft (30 m) mi = 32? A (132 ha) cluster	Fugitive dust	No effects predicted		No effects predicted		No effects predicted	
	Erosion	Some impact if prey items are impacted		Sedimentation of water bodies could destroy the use of these areas for waterfowl by destroying vegetation which they eat and smaller areas could be filled in. Additionally building up of sediment in larger bodies could lead to eutrophication & degradation of habitat.		For some animals, water sources could be destroyed; greater effect on aquatic species and those which use aquatic vegetation.	
	Loss of vegetation	Loss of habitat equal to disturbed area. Minimal effect on populations.		Loss of food in playa lakes.		Loss of habitat equal to disturbed area. Some individuals may lose entire range but minimal effects on populations.	
	Presence of machinery and people	All species expected to avoid this activity. Major impacts will be localized.	Sekoff, 1977. McGrew, 1979.	Avoidance when activities occur adjacent to water. No effects predicted if activity is greater than one mile from water areas containing waterfowl.		No effects on small animals such as reptiles and rodents. Minimal impact on larger animals such as birds and medium sized mammals Some avoidance	
	Operations						
	Fugitive dust	No effects predicted.		No effects predicted.		No effects predicted	
	Erosion	No effects predicted.		No effects predicted.		No effects predicted.	
	Revegetation of disturbed areas	Effects will depend upon changes in prey abundance in disturbed areas--may increase or decrease. Total effect on populations expected to be minimal but distribution may change somewhat.		No effects predicted.		Potential enhancement. Data insufficient to predict effects on population.	SFWS, 1978
	Transmission lines	No effects predicted		May be hazardous to migrating birds or when taking off from ponds. Effects on population not predictable from available data.	Kroodsma, 1978; Thompson, 1978	Birds of prey especially eagles, may be electrocuted on wires. Towers may be used for hunting perches and nesting. Data insufficient to predict effects on populations	Kroodsma, 1978 Stanlecher & Griese, 1979
Vehicle traffic OB to ASC 4,21? trips/yr ASC to clusters 51,?40 trips/yr Predicted 0 to 25 percent increase over present use	Fugitive dust	No effects predicted.		No effects predicted		No effects predicted	
	Road kills	Increase in proportion to increase in traffic volume. Data insufficient to predict effects.		No effects predicted.		[illegible] proportion [illegible] traffic [illegible] May be a [illegible] factor [illegible] small, isolated populations	Sargent & Forbes 197?
	Noise & visual	Increase in traffic may locally affect these animals but they may habituate.		Data insufficient to predict effects.		Data insufficient to predict effects	
Security	Radar & microwave emissions	Data insufficient to predict effects.		Data insufficient to predict effects		Data insufficient to predict effects	

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Table 1.3.3.2-1. Summary of potential impacts to wildlife in the Texas/ New Mexico study area (page 3 of 4).

PROJECT PARAMETER	SECONDARY EFFECTS	POTENTIAL IMPACTS			
		BIG GAME	REFERENCES	UPLAND GAME	REFERENCES
	Construction				
Area disturbed 121,930 A (49,382 ha) for DTN, cluster roads, and clusters (may be up to twice this for all roads and construction) Protective structure = 7.5 A structure road = 100 ft (30 m)/mi = 327 A (132 ha)/ cluster	Fugitive dust	No effects predicted.		No effects predicted.	
	Erosion	Sedimentation of important water sources.		No effects predicted.	
	Loss of vegetation	Loss of habitat equal to disturbed area. Relatively small amount of forage lost within range for all species.		Loss of habitat equal to disturbed area for quail, lesser prairie chicken, and rabbits. Minimal effects on rabbit and quail populations. Loss of strutting grounds and brood use areas have disproportionate effect on population size of lesser prairie chicken.	Wallestad, 1975; Peterson, 1970; Higby, 1969; Autenrieth, 1976; Klebenow, 1970
	Presence of machinery and people	Avoidance of construction activities. All species sensitive to human activities in range.		Avoidance expected to be small; minimal effect on populations.	
		Pronghorn: large overlap of range and suitable area for deployment	Wenausen, 1979;		
		Mule deer: small overlap of area suitable for deployment with range. Roads may cross other habitats and migration routes	Bellis & Graves, 1976; Hood & Inglis 1974		
		Minimal effects on mule deer. Potential for large impact to some pronghorn herds where key habitat is in vicinity of disturbance.			
	Operations				
	Fugitive dust	No effects predicted.		No effects predicted.	
	Erosion	No effects predicted.		No effects predicted.	
	Revegetation of disturbed areas	Areas not permanently disturbed may be used by upland game species. Level of use will depend upon rate of revegetation and species composition of plants. Potential for small population increase if disturbed areas become suitable for use.			
		Pronghorn: species of plants will determine use.	Tsukamoto, 1979		
		Mule deer: increases in shrubs for browse along roads or in pinyon-juniper areas could be beneficial.	Carbaugh, et al, 1975; Puglisi, et al, 1974		
	Transmission lines	No effects predicted.		No effects predicted.	
Vehicle traffic OB to ASC 4,[illegible]10 trips/yr ASC to clusters 51,040 trips/yr Predicted 0-25 percent increase over present use	Fugitive dust	No effects predicted.		No effects predicted.	
	Road kills	Increase in proportion to increase in traffic volume; may be a major factor in small isolated populations. Data insufficient to quantify effects.	Schultz & Bailey, 1978; Allen & McCullough, 1976; McQuivey, 1978	Increase in proportion to increase in traffic volume. Data insufficient to predict effects.	
	Noise & visual	Avoidance of areas near roads in proportion to traffic volume, resulting in habitat loss and disruption of migration routes.	Rost & Bailey, 1978; Schultz & Bailey, 1978; Lyon & Jensen, 1980	Minimal effects to population.	

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Table 1.3.3.2-1. Summary of potential impacts to wildlife in the Texas/ New Mexico study area (page 4 of 4).

PROJECT PARAMETER	SECONDARY EFFECTS	POTENTIAL IMPACTS			
		BIG GAME	REFERENCES	UPLAND GAME	REFERENCES
Vehicle traffic (cont.)	Noise & visual (cont.)	Potentially large effects on pronghorn due to disruption of movement patterns. Moderate effects on deer due to disruption of migration routes. Deer may habituate except in areas of heavy traffic.	Bruns, 1977		
Security	Radar and microwave emissions	Data insufficient to predict effects		Data insufficient to predict effects.	
	Sewage	Pollution of water sources may occur.		Pollution of water sources may occur. New ponds may attract these animals.	
People	Solid waste	Minimal effects expected		Species attracted to disposal sites may displace existing species. Data insufficient to quantify effects.	
Construction direct labor = 48,108 (peak)	Introduction of exotic species	Dogs running in packs may harass pronghorn and deer. Data insufficient to predict effects on populations	Boggess, et al, 1978; Denny, 1974; McNight, 1964	Dogs and cats may harass or kill upland game species, particularly young. Data insufficient to quantify effects populations.	Denny, 1974 McNight, 1964
Operations direct labor = 41,641 (peak) Induced growth = 33,303 (peak) Peak est. population = 101,529 Final est. population = 51,811 During construction, people will be dispersed throughout deployment area. During operations, people and effects will be concentrated in the vicinity of operating bases.	Recreation ORV use	Soil disturbance may change forage quality and quantity. All species may show behavioral avoidance of ORV use areas. Data insufficient to quantify effects on population.	Luckenbach & Bury, 1976.	Changes in vegetation resulting from soil disturbance may cause population decline. Most species may avoid ORV use areas, and some may be run over by ORVs. Data insufficient to quantify effects on population.	
	Camping, hiking, etc.	Deer & pronghorn may avoid areas of human activity. Data insufficient to quantify effects on populations.	McQuivey, 1978; Jorgensen, 1974; Welles & Welles, 1961; Geist, 1971; Boyd, 1978	Data insufficient to predict effects.	
	Hunting	No effect on populations since no increase expected. Number of applicants for permits currently exceeds supply.		Increased hunting pressure proportional to increased number of people. May require changes in management policy such as reduced bag limits or seasons to maintain population levels.	
	Poaching	Potential for decrease in populations, particularly in isolated areas since poaching may equal legal harvest. Deer most likely species to be poached since most abundant in deployment area. Most poaching expected during construction. Data insufficient to predict effect on populations.	Pursley, 1977.	Potential for population declines in upland game birds such as lesser prairie chicken and quail. Data insufficient to quantify effects.	

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mentation of surface water by nonpolluted runoff could have a positive, temporary impact on waterfowl, certain amphibians, pronghorn, pheasant, and other species dependent upon local surface water supply. The Salton Sea in California, and Freezeout Lake in Montana, exemplify agricultural runoff into lowlands which creates new wetland habitat. Degradation of surface water quality could result from uncontrolled construction-related runoff and could have a negative impact on those same species.

Increases in vehicle traffic will lead to increases in highway deaths of many kinds of animals (Schultz and Bailey, 1978). Nocturnal animals, including snakes, rodents, owls, skunks, and rabbits, will be especially vulnerable; Sargent & Forbes, 1973). Highway mortality can represent an important fraction of total mortality in the vicinity of roads. The effect may be especially noticeable on game species such as deer which are managed for sustained harvest. Should there be a significant number of road deaths, an increase in scavenging organisms such as crows, vultures, hawks, and coyotes may occur around roads, subjecting them to similar hazards. Traffic increases of 25 percent over present levels are expected.

The large network of roads and fences may restrict New Mexico pronghorn use and movements by introducing physical and visual barriers (Spillett, Low, and Sill 1967), but may free essentially "captive" pronghorn herds (Winkler, 1980) in Texas. Vegetation along roads differs from that of the surrounding area and the abundance and diversity of both plants and animals should change as roads are constructed. This expected change is currently under investigation in the Nevada/Utah study area.

Noises from vehicles, machines, air traffic, and explosives will most strongly affect animals such as big game, large mammalian carnivores, and birds of prey. Such animals will tend to retreat from the noise source (Rose and Bailey, 1979) and may desert the area for the duration of the activity (Lyon, 1979).

Radar and microwave emissions produced by surveillance and communications equipment potentially involve hazards to wildlife if the power output is high (Tyler, 1973; Steneck et al., 1980). Existing data, however, are insufficient for prediction of effects.

Electric power transmission lines are hazardous to flying birds (Willard, 1978). Transmission lines and poles also provide hunting perches for hawks and eagles which could be of considerable importance in extending their range and activity in this largely treeless region (Stahlecker and Griese, 1979).

The large work force necessary for constructing the M-X facilities will be dispersed over the deployment area in construction camps. When not working, these people will engage in outdoor recreation in the vicinity of their stations. Recreation activities most likely to adversely affect wildlife include hunting and ORV use. These activities are most likely to occur in the nearby mountain and riparian areas such as the Canadian Breaks and valleys of the Brazos and Pecos rivers and Palo Duro Canyon. The areas most suitable for recreation are also the most likely to contain wildlife concentrations. Hunting, if in accordance with state regulations, should have little adverse effect on game animal populations. Poaching, however, is likely to be a severe problem in most areas. Deer, pronghorn, barbary sheep, upland game birds, and waterfowl are the most likely animals to be shot since they are the

game animals present in the study area (Pursley, 1977). ORV use is expected to be high among construction workers, and access will be facilitated by construction activities. ORV use has been shown to be detrimental to wildlife (Busack and Bury, 1974). Intensive ORV use destroys habitat through vegetation removal and soil disturbance (Sheridan and Carroll, 1979). In addition, animals may be disturbed by vehicle noise or harrassed through chasing. Also, a localized group of foreign predators will be introduced in the work camps. Dogs and cats brought in with the construction crews can seriously impact native animals (Denny, 1974; Christian, 1974; Iverson, 1978). Increases in vehicle traffic associated with recreation will increase the number of animals killed by vehicles. Because most of the land in Texas is in private ownership, recreational impacts are likely to be relatively more concentrated on the public lands in New Mexico.

Effects on Selected Species

Birds of prey are an important group of animals likely to be affected by the project. Important species in the Texas/New Mexico study area include Swainson's hawk, marsh hawk, prairie falcon, turkey vulture, kestrel, short-eared owl, great horned owl, and barn owl. Because many of these birds are large, conspicuous, roadside animals, they are preferred targets for poachers. They are also subject to harrassment at their nests and to being killed by cars. Certain species (e.g., marsh hawks and short-eared owls) are expected to be highly sensitive to the project because they nest in the shortgrass habitat type in precisely those areas where M-X may be installed. Impacts of the M-X project on birds of prey is the subject of ongoing study.

All big game species of the region are likely to be impacted by M-X. Direct effects will primarily affect pronghorn and mule deer. Both are successful in areas of mixed native and agricultural vegetation (Cole and Wilkins, 1958). Loss of natural vegetation will reduce the quality of the habitat. Pronghorn tend to avoid roads and areas of intense human activity (Wehausen, 1979; Bruns, 1977), and therefore, will suffer displacement. Because overall space for game herds is limited due to intensive human use of the whole region, displacement may cause population declines of both pronghorn and mule deer in the deployment area proper. Road kills of mule deer are likely to increase proportional to increases in traffic. Preliminary engineering estimates of project-related traffic increases range from 0 percent to 25 percent, depending upon distance from the operationing bases and other facilities. Noise and traffic can reduce deer use of adjacent areas (Rost and Bailey, 1979), but, where runoff increases forage productivity and along unfarmed or ungrazed road edges, deer may be attracted and be exposed to traffic hazards (Carbaugh et al., 1975).

White-tailed deer and barbary sheep are less likely to be directly affected because populations tend to reside in geotechnically unsuitable areas. Huntable white-tailed deer herds in the Texas Panhandle are found almost exclusively in the eastern portions of the Canadian Breaks. Barbary sheep (Aoudad) are restricted, in Texas, to Palo Duro Canyon. In New Mexico, a small population of white-tailed deer is restricted to the southernmost part of the area associated with the Pecos River (Mescalero Sands), and barbary sheep are restricted to mountainous areas. Impacts to these species would result from increased hunting pressure and human presence due to recreational use of their habitats. Because the populations are currently small, poaching or harassment could lead to serious declines in the area.

Upland gamebird populations in the area will be impacted by changing habitat. Filling-in of playa lakes could reduce habitat critical for pheasant reproduction (Bolen et al., 1979). Reduced agriculture could negatively impact bobwhite quail, but would probably have a reciprocal effect on scaled quail and lesser prairie chickens if the areas were returned to natural vegetation. Habitat reduction, resulting from roads and structures, would negatively affect all upland game. Increased hunting pressure and human presence in the habitat would be the primary indirect impacts of the project on upland game species.

Any activities which change the number or size of the playa lakes in the region would impact the migratory and breeding waterfowl that utilize the High Plains portion of the central flyway (Bolen et al., 1979). However, augmentation of existing surface waters could enhance waterfowl. Reduction or degradation of such waters would be expected to have negative effects.

Furbearing animals of special concern are the muskrat, swift fox, beaver, bobcat, and badger. The swift fox and badger are sensitive because, within the study area, all of their preferred habitat is in areas where M-X may be sited. The swift fox is near extinction throughout much of its range and its reduced numbers have resulted from loss of habitat to agriculture, over-grazing, and past efforts to control predators such as coyotes and wolves (Egoscue 1979). Bobcats prefer riparian and scrub habitats, regions where recreation will probably be concentrated. Because bobcats only tolerate limited human presence, they will withdraw from these areas and, thus, lose part of their hunting grounds. The pelts of bobcats are valuable, currently selling for approximately $350, and trapping pressure is expected to coincide with the increase in human population. Small beaver and muskrat populations are found in the New Mexico river drainages of the study area. Increased recreational use of the habitats, trapping, and poaching could prove detrimental to those species.

Abundance, sensitivity to impact, and data quality were analyzed on a county-by-county basis and evaluated for pronghorn antelope, other big game, lesser prairie chicken, other upland game, and waterfowl. The three categories were ranked high, intermediate, or low for each wildlife subcategory.

Pronghorn

Abundance was considered high if the county had pronghorn herds with either harvest or population counts considered high (harvest-50-100; transect count 4-5 per minute). Abundance was considered medium if the counties contained pronghorn herds with medium numbers or harvest (harvest-25-50; counts 2-3 per minute). Abundance was rated low if the county had low numbers or harvest of pronghorn (harvest less than 25; count less than 2 per minute).

Sensitivity to impact was considered high in all counties which contained a high abundance of pronghorn in geotechnically suitable areas. Intermediate sensitivity was used for intermediate abundances or for herds partly in geotechnically unsuitable areas. Sensitivity was rated low if the counties contained low abundance pronghorn herds, or if herds were restricted to unsuitable areas.

Data quality was rated high for all counties in Texas, although they lack site-specificity. New Mexico counties provided intermediate quality data, and no low quality data were collected.

Abundant pronghorn populations were found in Hartley, Randall, and Oldham counties, Texas; and Harding and Union counties, New Mexico (Table 1.3.3.2-2). Hartley, Randall, Harding, and Union counties each were rated as having intermediate sensitivity to impact because project features would influence some of the available pronghorn range. The Oldham County pronghorn herd has a low sensitivity to impact because it occurs largely in the geotechnically unsuitable Canadian Breaks area.

Other Big Game

Abundance was considered high if the Department of Wildlife big game investigation reports indicated high abundance for mule deer, white-tailed deer, or barbary sheep. Abundance was also rated high if the distribution maps provided by the state wildlife agencies indicated that mule deer abundance was at intermediate levels and at least one other species was also present in the hydrographic area. Abundance was considered intermediate if the state wildlife agency maps indicated that the hydrographic area contained a low abundance of mule deer.

Sensitivity to impact was rated high if the county contained mule deer in geotechnically suitable areas. Sensitivity was considered intermediate if the county contained mule deer or white-tail deer. Low sensitivity was assumed for counties that contained only barbary sheep or no big game species. Data quality was considered high if either of the state wildlife agencies provided population estimates or species range was well defined. Data quality was rated intermediate if the state wildlife agency provided no estimate of population or mule deer range was poorly defined. Data quality was low if no data were available.

Big game (other than pronghorn) were rated abundant in Hartley, Randall, and Oldham counties, Texas, and in Chaves, DeBaca, Guadalupe, Harding, and Union counties, New Mexico. Only Chaves county was rated as having high sensitivity to impact, because the project potentially impinged on almost the entire mule deer range. Other counties were rated as having intermediate or low sensitivity, depending upon the degree of impingement of the project upon mule deer range.

Lesser Prairie Chicken

Abundance was considered high if there was a harvestable population of lesser prairie chickens in the county. Abundance was intermediate if the species was reported in the county, but was not harvestable, and was rated low if the county contained no known prairie chicken populations.

Sensitivity to impact was rated high if the species was present, was intermediate if the county contained areas of appropriate habitat and no known prairie chicken populations, and low if the county contained no good habitat.

Quality of data was rated high for those counties for which the numbers were provided. Data quality was judged intermediate in those counties for which the species was reported without population data. Data quality was considered low where the species was not reported.

Lesser prairie chickens were rated as abundant in Cochran County, Texas, and DeBaca, Lea, and Roosevelt counties, New Mexico (Table 1.3.3.2-2). Sensitivity to

Table 1.3.3.2-2. Abundance, sensitivity to impact, and data quality for pronghorn, other big game, Lesser Prairie Chicken, other upland game birds, and waterfowl, Texas/New Mexico High Plains.

FULL BASING	SPLIT BASING		COUNTY (STATE)	PRONGHORN			OTHER BIG GAME[a]			LESSER PRAIRIE CHICKEN			OTHER UPLAND GAME BIRDS[b]			WATERFOWL		
	S	N		A	S	Q	A	S	Q	A	S	Q	A	S	Q	A	S	Q
X	X		Bailey (TX)	L	L	H	L	L	H	L	L	H	H	I	H	H	H	H
X	X		Castro	L	L	H	L	L	H	L	L	H	H	I	H	I	H	L
X	X		Cochran	I	L	H	L	L	H	H	I	H	I	L	H	I	H	L
X		X	Dallam	I	H	H	L	L	H	L	L	H	H	I	H	I	H	L
X	X	X	Deaf Smith	L	L	H	I	L	H	L	L	H	H	I	H	I	H	L
X		X	Hartley	H	I	H	H	L	H	L	L	H	H	I	H	I	H	L
X			Hockley	L	L	H	L	L	H	L	L	H	H	L	H	I	H	L
X	X		Lamb	L	L	H	L	L	H	L	L	H	H	I	H	I	H	L
X		X	Moore	L	H	H	I	L	H	L	L	H	H	I	H	I	H	I
X		X	Oldham	H	L	H	H	L	H	L	L	H	H	I	H	I	H	L
X	X	X	Parmer	L	L	H	L	L	H	L	L	H	H	I	H	I	H	L
X			Randall	H	I	H	H	I	H	L	L	H	H	I	H	I	H	H
X		X	Sherman	L	L	H	L	L	H	L	L	H	H	L	H	L	L	L
X	X		Chaves (NM)	I	H	I	H	H	H	L	L	H	H	I	H	H	H	H
X	X	X	Curry	L	H	I	L	L	H	L	L	H	H	I	H	I	H	I
X	X		De Baca	I	I	I	H	I	H	H	I	H	H	I	H	H	H	H
X			Guadalupe	L	L	I	H	L	H	L	L	H	H	L	H	I	H	I
X		X	Harding	H	I	I	H	I	H	L	L	H	I	I	H	I	H	I
X			Lea	L	L	I	L	L	H	H	L	H	H	L	H	L	L	I
X	X	X	Quay	L	L	I	I	L	H	L	L	H	H	I	H	L	L	I
X	X		Roosevelt	L	L	I	I	H	H	H	H	H	H	I	H	H	H	H
X		X	Union	H	I	I	H	L	H	L	L	H	H	I	H	H	H	H

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[a] Mule deer, white-tailed deer, soudad.

[b] Scaled quail, bobwhite, turkey, pheasant, mourning dove.

A = Abundance. S = Sensitivity to impact; Q = Quality of data
H = High; I = Intermediate; L = Low

impact was rated high in Roosevelt County. In that county, project features could impact most of the habitat (Figure 1.3.3.2-1). The other counties had intermediate or low sensitivity because relatively little habitat information was available for them.

Other Upland Game

Abundance was considered high if either: (a) quail were rated abundant and any other species occurred in the county, or (b) quail were rated of intermediate abundance and two other species occurred in the county. Abundance was rated intermediate if either: (a) the county contained only quail of intermediate to high numbers; (b) the county contained low numbers of quail and at least one other species was present; or (c) the county contained any single species other than quail. Abundance for the county was considered low if: (a) the county had low numbers of quail and no other species or if (b) upland game birds were absent.

Sensitivity to impact was rated medium if pheasant were present and low if other upland game species were present without pheasant. The high category was not used. Quality of data was rated high.

Bobwhite and scaled quail were reported for almost every county in the study area, and most counties also contained mourning dove (Table 1.3.3.2-2). Hence, all counties except Cochran County, Texas, and Lea County, New Mexico, were given a high abundance rating. Most counties also contained pheasant, which resulted in many intermediate sensitivity ratings. No county was considered highly sensitive to impact, because of the generally high numbers and ubiquitousness of upland games species.

Waterfowl

Waterfowl abundance was called high according to available records if (a) peak seasonal abundance exceeded 500,000 birds, or (b) the county contained a National Wildlife Refuge, or (c) abundant suitable habitat (playa lakes) was present. Abundance was called intermediate if high abundance criteria were not met and if the county contained major waterfowl areas, such as large playa lakes and rivers. All other watersheds were considered of low waterfowl abundance.

Sensitivity to impact was considered high if the county had a high or intermediate abundance rating. This judgment is based on the fact that all such counties have significant wetland areas, and wetlands are highly sensitive to impact. Sensitivity was rated low if abundance was low, since low abundance implied lack of significant wetlands.

Data quality was regarded as high if there were numerical estimates of abundance or if the county contained a National Wildlife Refuge. Data quality was regarded as intermediate in all other counties, since waterfowl abundances are monitored.

Bailey County, Texas, and Chaves, De Baca, Roosevelt, and Union counties, New Mexico, were given high waterfowl abundance ratings (Table 1.3.3.2-2) and project elements could be emplaced fairly close to waterfowl habitats (Figures 1.3.3.2-1 through 1.3.3.2-3). All of these counties are rated as highly sensitive.

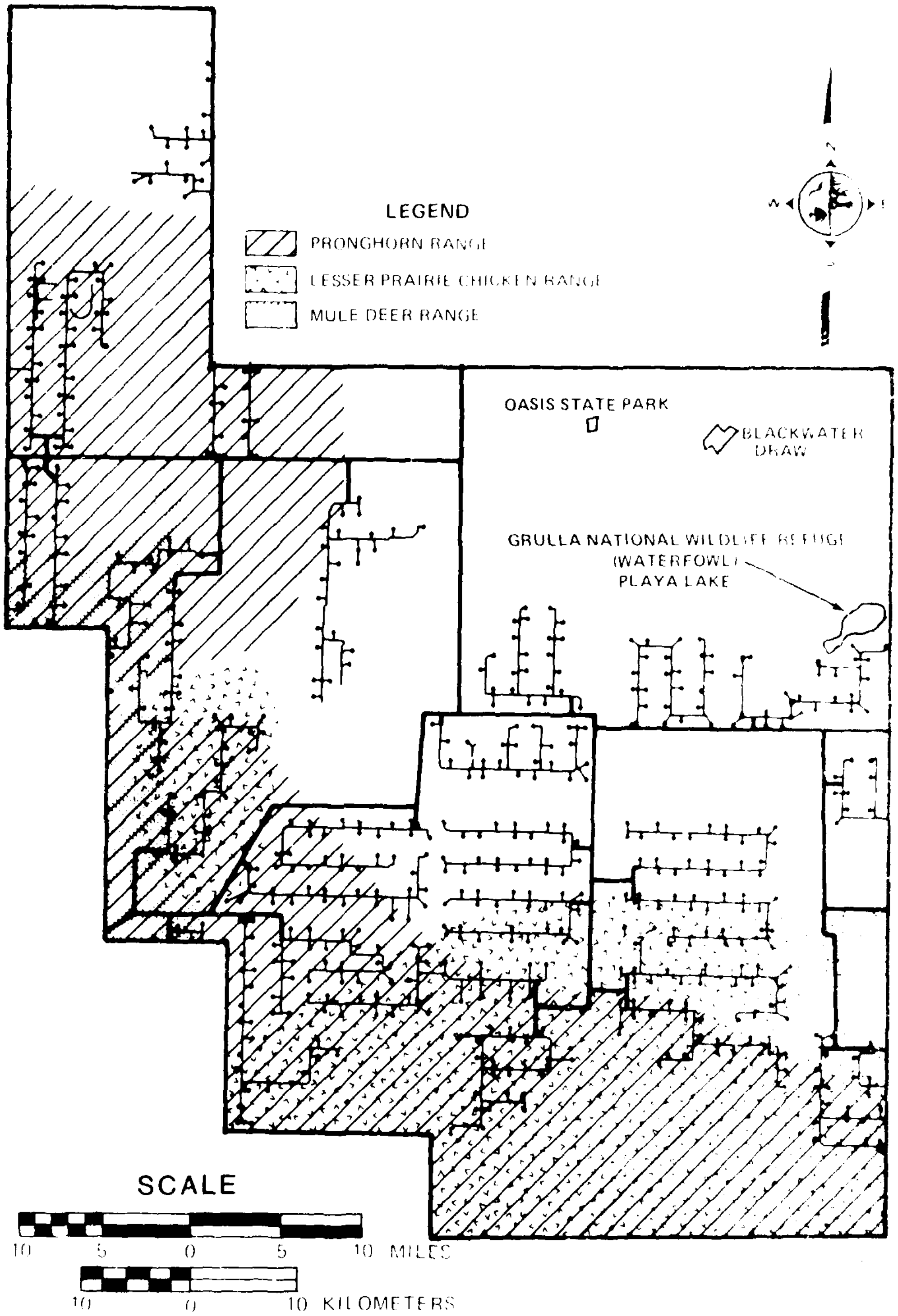

Figure 1.3.3.2-1. Distribution of pronghorn, lesser prairie chicken, and mule deer in Roosevelt County, New Mexico.

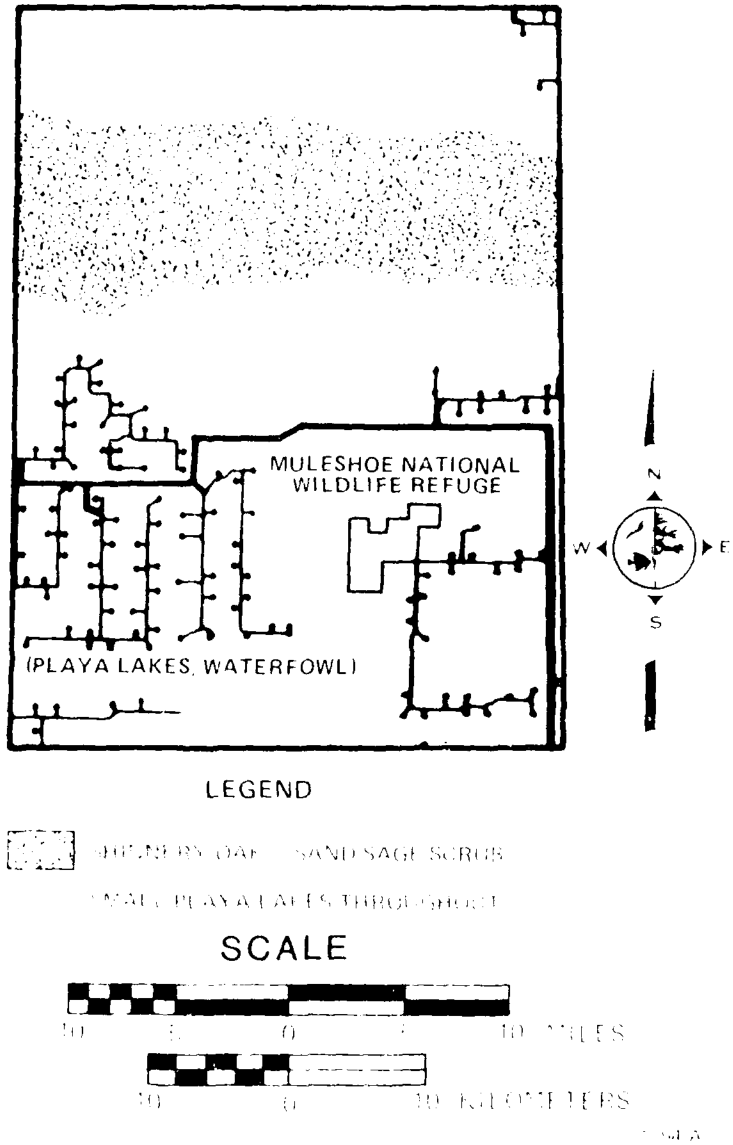

Figure 1.3.3.2-2. Waterfowl areas in Bailey County, Texas, in relationship to the conceptual project layout.

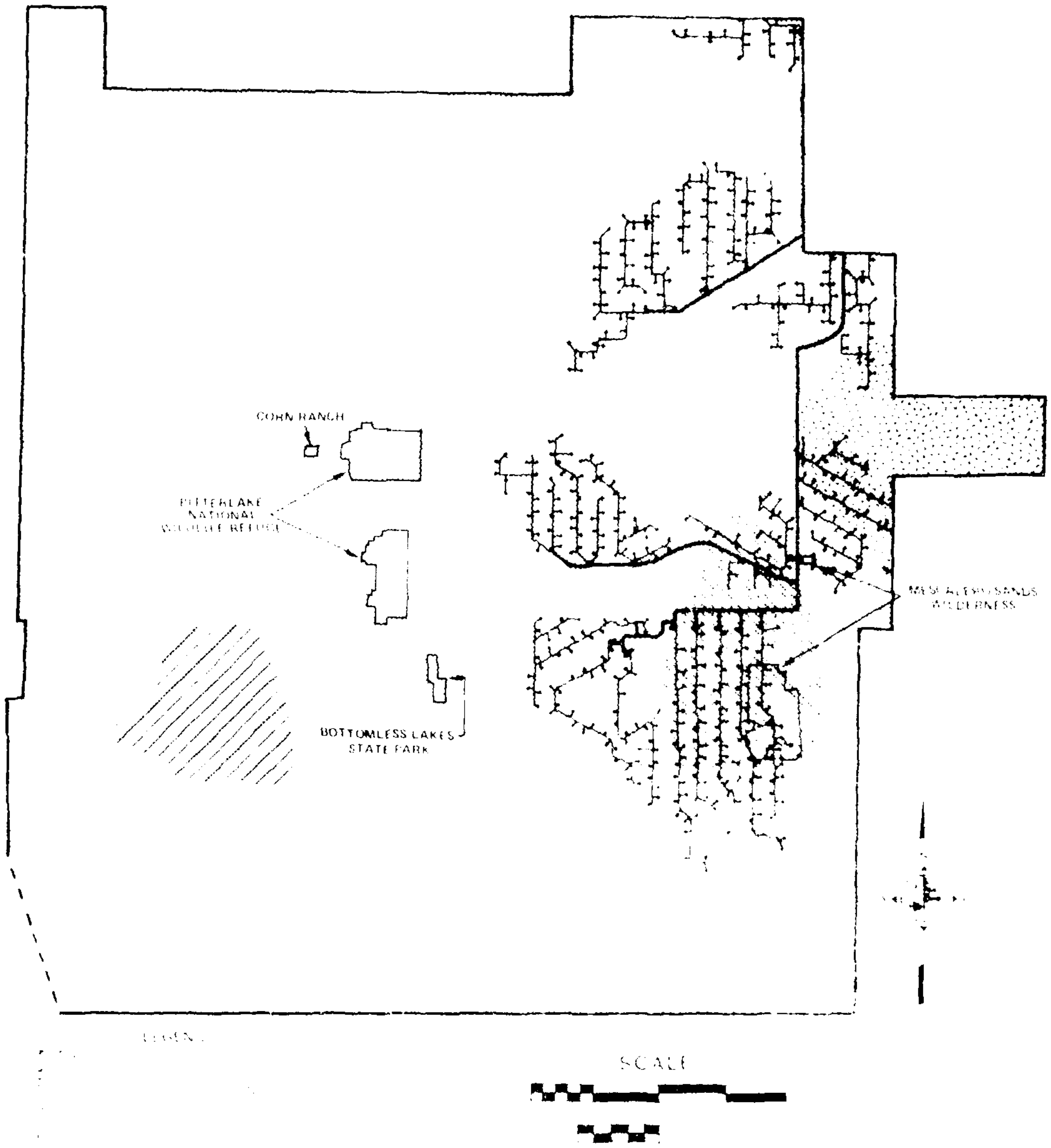

Figure 1.3.3.2-3. Wildlife distribution in Chaves County, New Mexico, in relationship to the conceptual project layout.

Hydrologic subunits that (1) are involved in one or more specific system layouts, and that (2) were ranked high in abundance and sensitivity for the particular resource were used as examples of area specific impacts (Table 1.3.3.2-2) of different project elements. These examples indicate specific areas technically suitable for project siting but where impact potential for a particular resource is comparatively high. The following paragraphs discuss effects of DTN, clusters, and OBs on pronghorn, other big game, lesser prairie chicken, other upland game and waterfowl.

Pronghorn

Clusters will be located in each of the counties of the study area. Clusters are likely to impact pronghorn in Roosevelt County, New Mexico (Figure 1.3.3.2-1), and Dallam and Oldham counties, Texas (Figure 1.3.3.2-4). There is potential for extensive overlap of the project with occupied pronghorn range in both counties. This would range from about 10 percent in Oldham County to over 80 percent in Dallam County. Deployment within the range would result in reduction of numbers of pronghorn in those counties. Fences and fragmentation of habitat resulting from cluster construction could also have effects on the herds, but would depend on the ability of pronghorn to adapt to the new roads.

Indirect effects on pronghorn resulting from human presence, hunting, and poaching will also be intense in these two counties. Dallam and Oldham county pronghorn populations are currently either on private lands or on the Rita Blanca National Grassland. Release of the private lands from current ownership could be expected to exacerbate indirect impacts of the project on pronghorn by making herds more available to less closely regulated hunting (Cole and Wilkins, 1958).

Construction of DTN in the Texas/New Mexico area is expected to occur primarily along existing roads. Therefore, impacts on pronghorn due to construction of DTN should be minimal and would be essentially similar to those described for clusters.

There is no OB planned for placement in any pronghorn habitat. If a base were constructed in pronghorn habitat it would be expected to result in reduction of the present herd-size, due both to habitat loss and to effects of traffic and people in existing habitat.

The location of a main base at Cannon AFB, New Mexico, would have no direct impact on pronghorn habitat. Indirect effects resulting from population growth of about 42,000 by 1986 would be noticed in nearby Roosevelt County. Hunting pressure on that herd, given the availability of permits, is unlikely to increase.

Other Big Game

Construction of clusters would have a direct effect on mule deer in Chaves County, New Mexico (Figure 1.3.3.2-3). The Chaves County mule deer herd is widely distributed in geotechnically suitable areas. In addition, the white-tail deer herd located at Mescalero Sands would be impacted if clusters were placed there. It is a small, non-huntable, relict herd restricted to a limited area of shinnery oak sand dune habitat.

Increased hunting and poaching pressure is expected to affect mule deer and barbary sheep herds throughout the area in both Texas and New Mexico. The

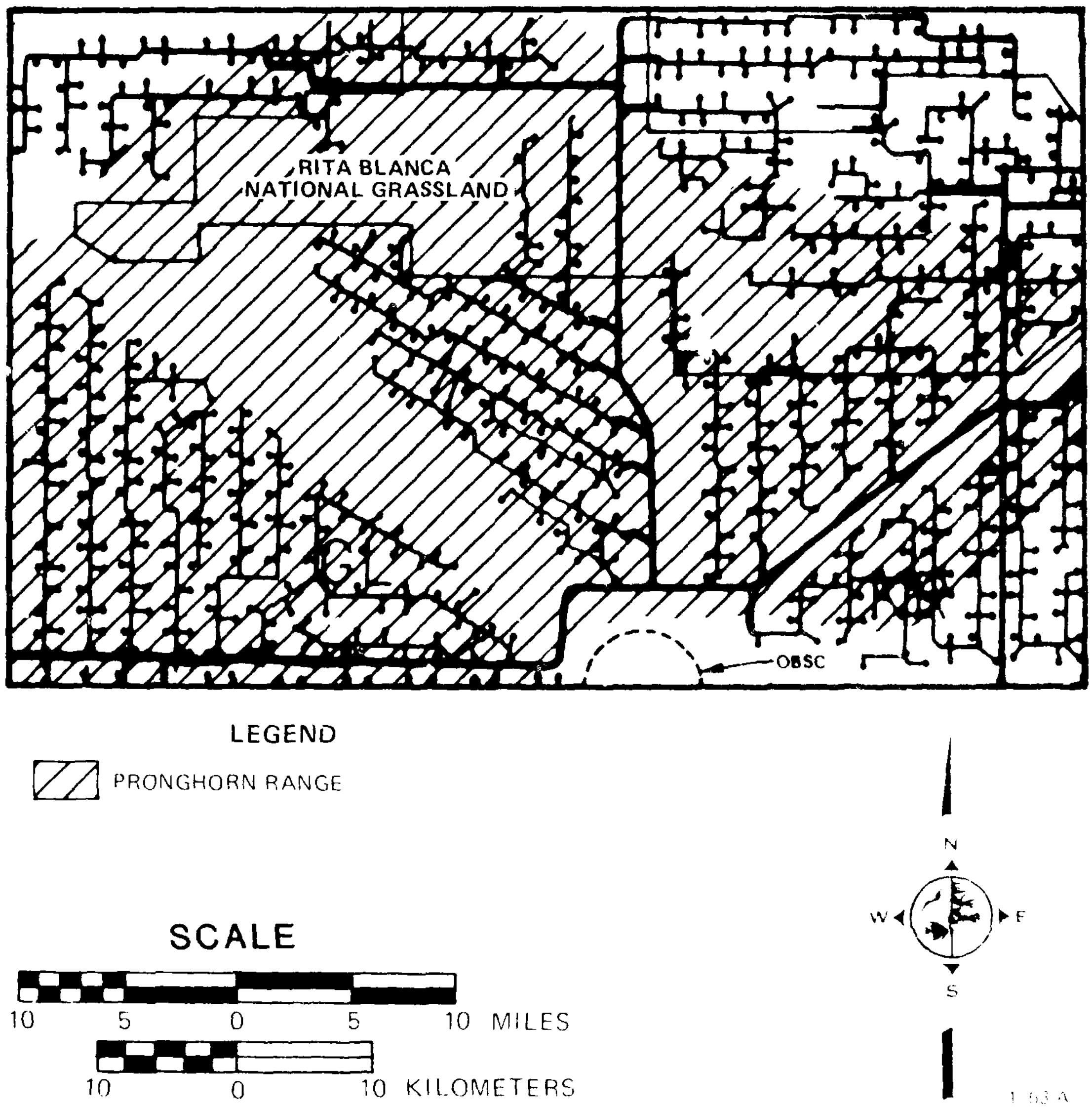

Figure 1.3.3.2-4. Pronghorn distribution in Dallam County, Texas, in relationship to the conceptual project layout.

barbary sheep herds are small, and hunting is currently closely regulated. Increased poaching or hunting could have a deleterious effect on the herds. Human presence should have less effect on deer than on pronghorn, but still may affect big game in the region surrounding the proposed basing area. Road kills would be expected to increase. For instance, deer kills seem to be correlated with traffic (see Nevada/Utah Section).

Construction of DTN is expected to be largely restricted to improvement of existing roads. Big game habitat loss should, therefore, be minimal. Other effects are expected to be similar to the effects to be caused by cluster construction.

No OBs are planned for placement in deer or barbary sheep habitat. Local population increase resulting from placem[illegible] f an OB in the region is expected to result in increase in hunting pressure o[illegible] game. The Canadian Breaks and mountainous areas of northeastern New Me[illegible] [illegible]ntable populations of mule deer; and Palo Duro Canyon, Texas, and s[illegible] [illegible]w Mexico have populations of barbary sheep.

The location of a main base near [illegible] Mexico, will have no d[illegible]ect impact on other big game. Indirect effe[illegible] to population incre[illegible]se will be similar to those discussed above for the OB.

Lesser Prairie Chicken

Cluster construction and deployment will directly impact prairie chicken habitat in Chaves, Lea, Roosevelt, and DeBaca counties, New Mexico, and Cochran County, Texas (Figures 1.3.3.2-1 and 1.3.3.2-3). Expected impacts would be removal of habitat (short grass prairie associations) and booming grounds. (Booming grounds are traditionally-used areas of communal courtship and breeding.) Lesser prairie chickens will boom on oil well pads and other artificial clearings, but require stands of native grasses for nesting and brood rearing. Portions of habitat could be impacted in New Mexico, but little would be affected in Texas.

Indirect effects during construction and operation are interference by excessive human presence during the breeding season, increased hunting pressure, and poaching. Interference could be the most serious indirect impact, although behavioral responses of lesser prairie chickens to excessive human presence are poorly understood.

DTN construction and operation should have a qualitatively similar impact to cluster construction and operation, but on a reduced scale. Increased vehicular traffic through the habitat may result in increased mortality of the birds.

No OB is planned for any county with a lesser prairie chicken population. Indirect impacts associated with increased regional population size resulting from construction and operation of an OB should be as described above: interference, increased hunting, poaching. These are likely to be ameliorated because of the relatively great distance of the OB from any known huntable populations of prairie chickens.

Construction of a main base at Cannon AFB, New Mexico, will have no direct impact on lesser prairie chickens. Operation will result in indirect impacts due to

population increase in the region. Three prairie chicken population areas are within an easy travel distance of Cannon AFB. Hunting pressure on the populations will increase and poaching may increase as a result of human population increase.

Upland Game

Construction of clusters in any county will directly impact one or more upland game species by disturbance and habitat removal. Indirect impacts will result from increased hunting pressure during both construction and operation. Poaching may increase during construction.

The impacts associated with DTN construction and operation are likely to be indistinguishable from the effects of clusters. Operation will result in increased vehicle traffic which is expected to lead to increased game bird mortality.

Construction and operation of an operating base in Oldham County, Texas, will have direct and indirect impacts on upland game. Overall, however, the amount of habitat removed for construction will be a small portion of the total available, and most impacts to upland game should be relatively minor. Huntable populations of turkey occur to the east and could be significantly impacted by the increased hunting pressure expected to result from human population increase associated with the OB.

The main base at Cannon AFB, New Mexico, will probably have direct impact on some bobwhite and pheasant habitat. Most of the impact of the main base to upland game will result from human population growth. Regional populations of upland game species will receive increased hunting pressure during construction and operation, especially during operation in the case of a main base.

Waterfowl

Construction and operation of clusters will influence waterfowl only if water quality degradation in rivers or playa lakes occurs or if playa lakes are impacted by construction activities. This will depend upon onsite construction decisions. Large numbers of waterfowl in the study area are found in several national wildlife refuges which would not be directly impacted.

Indirect impacts will include increased hunting pressure, human presence, and poaching during construction and operation. Because few waterfowl species breed in the region, interference is likely to be minor (Bolen et al., 1979). Increased hunting and poaching could well have significant impact on waterfowl using the High Plains portion of the central flyway, especially poaching, because hunting is regulated by the bird population sizes, not hunting demand.

Impacts to waterfowl resulting from construction and operation of DTN should be virtually the same as those for clusters. There is some potential for direct impact to waterfowl habitat in small playa lakes, but most impacts will be associated with the increased numbers of people in the region during construction.

There should be no direct, construction-related impacts due to the operating base. Some impact to waterfowl may occur in the area because of increased air traffic during the operation phase. Most impacts to waterfowl should result from increased human population during operation. Increased hunting, poaching, and

human presence in and near waterfowl habitat are likely to have a significant impact on waterfowl in the vicinity of the OB.

Construction and operation of a main base at Cannon AFB, New Mexico, would have impacts on waterfowl essentially the same as for a second base. The greater population increase anticipated for a main base is expected to multiply the severity of the impacts, but not to change them qualitatively.

1.4 FUTURE TRENDS WITHOUT M-X

Without M-X, three major factors will be important in determining future trends for biological resources in the potential deployment area. These factors are: (1) the effects of temporary and permanent population increases, (2) the ongoing development of agricultural resources of the area, and (3) the ongoing development of minerals and energy of the area.

Population projections for the Great Basin study area indicate an increase of more than 55 percent for the thirteen county bi-state region between 1980 and 1994. Utah will account for 44 percent of the change and Nevada 56 percent. Most of this growth is expected to occur in existing metropolitan areas.

For wildlife populations, future trends are generally difficult to assess since they would require predictions of abiotic and biotic events. If we assume that these variables will continue to fluctuate as they have in the past and we project increases in human populations in the absence of M-X, some predictions about wildlife distributions and densities are possible.

In the Nevada/Utah study area, predictions for future terrestrial vertebrate populations are based on factors that can be both conducive and detrimental to local abundances. For instance, the BLM's protection of rangelands through its allotment management plans should have beneficial effects on wildlife. This plan, if successful, will have greater effects in Nevada than in Utah because more BLM acreage is in Nevada (ca. 28,700,000 vs. 6,800,000 acres). Projected increases in wildlife will be offset by expanding mining and energy-producing activities which tend to have localized effects. Wildlife responses to such disturbances are usually avoidance. Extraction of coal by the Allen-Warner project, being considered in Washington and Iron Counties in Utah, will have long-range effects on wildlife, both as a disturbance factor during production and as having potential beneficial effects during revegetation. The Roosevelt Hot Springs Geothermal Energy Exploration and Power Plant, under consideration for Beaver County, Utah, will affect wildlife, at least to the extent that the area will be avoided. In general, concentrations of construction workers for such large-scale activities and the general increase in mining throughout the region will have a depressing effect on the populations of wildlife species through poaching and, to a lesser extent, through hunting.

Agricultural practices and the use of grazing lands are not expected to increase during the next 20 years to the point of depressing native faunal elements. Human population growth without M-X is also expected to be small in potential M-X deployment areas. For example, White Pine and Beaver Counties are expected to grow at -0.3 and 1.5 percent rates, respectively, between 1981 and 1992.

In the Texas/New Mexico high plains, wildlife trends will be tied to agricultural land-use trends, which will also be a factor in determining overall

human population growth. Approximately 90 percent of the land is currently used for rangeland or agriculture. These proportions are projected to change as groundwater becomes increasingly expensive to pump for irrigation because of aquifer depletion. The lifetime of the Ogallala aquifer in the study area is projected to be nearly 70 years, but economic constraints have already caused abandonment of irrigation in southern parts of the study area. Present trends indicate conversion of irrigated cropland to dryland farming rather than rangeland. This trend should not produce major changes in wildlife abundances or species composition until aquifer overdrafts cause a cropland-to-rangeland shift. There may also be demands on playa lakes for irrigation, a practice not widely followed at present, which could result in changes in species composition.

Common and Typical Species

In the Nevada/Utah study areas, populations of common and typical species of animals may remain stable or, possibly, expand. Habitat recovery is a goal of the Bureau of Land Management, which is responding to past years of heavy grazing (BLM, 1979). If grazing is reduced, vegetation on decreasing ranges should stabilize or increase and most animal species will benefit. Both the Nevada Department of Wildlife and the Utah Division of Wildlife Resources have recently funded non-game wildlife programs which will also help maintain, and in certain instances increase, animal populations. Normal population fluctuations will occur throughout the Nevada/Utah desert area as certain species respond to high and low plant production.

In the Texas/New Mexico study area, many common and typical species are most abundant in the rangeland and areas such as the Canadian Breaks, where vegetation bears some resemblance to the original shortgrass prairie. There would be no changes expected in these distributions unless the proportion of rangeland to farmland changes. An increase in rangeland would allow increases in abundance of some shortgrass prairie prey and predator species (including, perhaps, the now rare swift fox).

Game Animals

Present hunting demand exceeds the supply for most big game animals in Nevada and Utah. Big game populations are generally intensively managed to support hunting demands. Thus, management plans to increase populations in these species are expected. Most upland game species are short-lived and considerable fluctuations in population size are common. In the future, population levels are expected to display these fluctuations with long-term abundances remaining about the same. For some species (e.g., sage grouse) habitat loss, particularly loss of key habitat such as leks and and brood use areas, may result in declining populations. Furbearer and waterfowl densities should remain static so long as water tables remain within their current fluctuation levels. Increases or decreases in these species are related to changes in surface water availability which is related to groundwater tables and precipitation.

In Texas and New Mexico, increased hunting presence is expected to be roughly proportional to projected human population increases which are not expected by state agencies to show slow growth. Increased pressure may be beneficial for some herds (e.g., mule deer) which are in poor condition from overcrowding. Other

big game herds may increase in number if farmland is converted to rangeland. Upland game species would be expected to remain stable, even with a modest increase in hunting, unless the proportion of rangelands increases. The large numbers of migrating and wintering waterfowl should show normal natural fluctuations as long as the larger playa lakes remain unmodified or only slightly altered.

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1.6 APPENDICES

APPENDIX A. (1.6.1)

Common and typical wildlife species in the Nevada/Utah and Texas/New Mexico study areas.

Table 1.6.1-1. Common and typical amphibians, reptiles, and mammals, Nevada/Utah study area.

SPECIES	A	R	BS	SG	SDS	PJW
Amphibians						
Frogs and Toads						
Great Basin Spadefoot *Scaphiopus intermontanus*	X	X	X	O	O	X
Reptiles						
Lizards						
Zebra-tailed Lizard *Callisaurus draconoides*	O	O	O	X	X	O
Leopard Lizard *Gambelia wislizenii*	O	O	X	X	X	O
Collared Lizard *Crotaphytus collaris*	O	O	O	X	O	O
Side-blotched Lizard *Uta stansburiana*	O	O	X	X	X	X
Desert Horned Lizard *Phrynosoma platyrhinos*	O	O	O	X	X	O
Western Whiptail *Cnemidophorus tigris*	O	O	X	X	X	X
Western Fence Lizard *Sceloporus occidentalis*	O	X	X	O	O	O
Desert Spiny Lizard *S. magister*	O	X	O	X	O	O
Sagebrush Lizard *S. graciosus*	O	O	X	X	O	O
Western Skink *Eumeces skiltonianus*	O	X	O	O	O	O
Snakes						
Common Kingsnake *Lampropeltis getulus*	O	X	O	O	O	X
Coachwhip *Masticophis flagellum*	O	O	O	X	O	O
Striped Whipsnake *M. taeniatus*	O	O	X	X	O	O
Western Patch-nosed Snake *Salvadora hexalepis*	O	O	O	X	O	O
Great Basin Gopher Snake *Pituophis melanoleucus*	O	O	X	X	O	X
Long-nose Snake *Rhinocheilus lecontei*	O	O	O	X	X	O
Western Groundsnake *Sonora semiannulata*	O	O	O	O	X	O
Spotted Nightsnake *Hypsiglena torquata*	O	O	X	O	O	O
Great Basin Rattlesnake *Crotalus viridis lutosus*	O	O	X	X	X	X
Mammals						
Insectivores						
Merriam Shrew *Sorex merriammi*	O	O	X	O	O	O
Bats						
Small-footed Myotis *Myotis subulatus*	O	O	X	O	O	X
California Myotis *M. californicus*	O	O	O	X	O	X
Little Brown Myotis *M. lucifugus*	O	X	O	O	O	X
Western Pipistrelle *Pipistrellus hesperus*	O	O	O	X	O	X
Big Brown Bat *Eptesicus fuscus*	O	X	X	X	O	X
Bats (continued)						
Pallid Bat *Antroxous pallidus*	O	O	X	X	O	O
Big-eared Bat *Plecotus townsendi*	O	O	X	O	O	X
Big Freetail Bat *Tadarida macrotis*	O	O	O	O	O	X
Rodents						
Rock Squirrel *Spermophilus variegatus*	O	O	X	X	O	X
Whitetail Antelope Ground Squirrel *Ammospermophilus leucurus*	O	O	O	X	X	X
Valley Pocket Gopher *Thomomys bottae*	O	O	X	X	O	X
Little Pocket Mouse *Perognathus longimembris*	O	O	X	X	X	X
Great Basin Pocket Mouse *P. parvus*	O	O	X	X	O	X
Ord's Kangaroo Rat *Dipodomys ordii*	O	O	X	X	X	O
Great Basin Kangaroo Rat *D. microps*	O	O	X	X	X	O
Western Harvest Mouse *Reithrodontomys megalotis*	O	X	X	X	O	O
Deer Mouse *Peromyscus maniculatus*	O	X	X	X	O	X
Canyon Mouse *P. crinitus*	O	O	O	X	O	O
Southern Grasshopper Mouse *Onychomys torridus*	O	O	X	X	O	O
Sagebrush Vole *Lagurus curtatus*	O	O	X	O	O	O
Mountain Vole *Microtus montanus*	X	O	O	O	O	O
Desert Woodrat *Neotoma lepida*	O	O	O	X	O	O
Porcupine *Erethizon dorsatum*	O	X	X	O	O	X
Rabbits						
Black-tailed Jackrabbit *Lepus californicus*	O	O	X	X	O	X
Desert Cottontail *Sylvilagus auduboni*	O	X	X	X	X	X
Carnivores						
Badger *Taxidea taxus*	O	O	X	X	O	O
Spotted Skunk *Spilogale gracilis*	O	X	O	O	O	X
Striped Skunk *Mephitis mephitis*	O	X	X	X	O	X
Coyote *Canis latrans*	O	O	X	X	X	X
Gray Fox *Urocyon cinereoargentus*	O	O	X	O	O	X
Kit Fox *Vulpes macrotis*	O	O	X	X	X	X
Bobcat *Lynx rufus*	O	X	X	X	O	X
Mountain Lion *Felix concolor*	O	O	O	O	O	X

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Key: A = Aquatic, R = Riparian, BS = Big Sage, SG = Shadscale-Greasewood, SDS = Sand Dune-Sandy, PJW = Pinyon-Juniper Woodland.

Sources: Stebbins, 1966, Burt and Grossenheider, 1976, Hall and Kelson, 1959.

Table 1.6.1-2. Common and typical species of birds of the Nevada/Utah study area (page 1 of 3).

SPECIES	AQUATIC	RIPARIAN	BIG SAGE	SHADSCALE AND GREASEWOOD	PINYON-JUNIPER WOODLAND	TREE PLANTATIONS
Raptors (Falconiformes)						
Turkey Vulture *Cathartes aura*		S	S	S	S	S
Cooper's Hawk *Accipiter cooperii*	P					P
Red-tailed Hawk *Buteo jamaicensis*		P	P		P	P
Rough-legged Hawk *Buteo lagopus*				W		
Ferruginous Hawk *Buteo regalis*				ST		
Golden Eagle *Aquila chrysaetos*	P	P	P	P	P	P
Marsh Hawk *Circus cyaneus*	P	P	P	P	P	P
Prairie Falcon *Falco mexicanus*		P	P	P		P
Kestrel *Falco sparverius*		P	P	P	P	P
Doves (Columbidae)						
Mourning Dove *Zenaida macroura*	ST	ST	ST		ST	ST
Owls (Strigidae)						
Great Horned Owl *Bubo virginianus*		P				P
Burrowing Owl *Athene cunicularia*				P		
Nightjars (Caprimulgidae)						
Poorwill *Phalaenoptilus nuttalli*		S		S		
Common Nighthawk *Chordeiles minor*	ST	ST	ST		ST	
Woodpeckers (Picidae)						
Flicker *Colaptes auratus*		P	P		P	P
Downy Woodpecker *Dendrocopos pubescens*		P				P
Red-naped Sapsucker *Sphyrapicus varius*		W				W
Flycatchers (Tyrannidae)						
Western Kingbird *Tyrannus verticalis*		ST		ST	ST	ST
Say's Phoebe *Sayornis saya*		S			S	S
Dusky Flycatcher *Empidonax oberholseri*		T				T
Gray Flycatcher *Empidonax wrightii*			ST			
Western Wood Pewee *Contopus sordidulus*		T				T
Larks (Alaudidae)						
Horned Lark *Eremophila alpestris*				P		
Swallows (Hirundinidae)						
Violet-green Swallow *Tachycineta thalassina*	ST	ST	ST	ST	ST	ST
Tree Swallow *Iridoprocne bicolor*	ST	ST	ST	ST	ST	ST
Barn Swallow *Hirundo rustica*	ST	ST	ST	ST	ST	ST
Cliff Swallow *Petrochelidon pyrrhonota*	ST	ST	ST	ST	ST	ST

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Table 1.6.1-2. Common and typical species of birds of the Nevada/Utah study area (page 2 of 3).

SPECIES	AQUATIC	RIPARIAN	BIG SAGE	SHADSCALE AND GREASEWOOD	PINYON-JUNIPER WOODLAND	TREE PLANTATION
Crows (Corvidae)						
Raven *Corvus corax*		P	P	P	P	P
Scrub Jay *Aphelocoma coerulescens*					P	
Pinyon Jay *Gymnorhinus cyanocephalus*					P	
Black-billed Magpie *Pica Pica*		P	P		P	P
Bushtits (Paridae)						
Plain titmouse *Parus inornatus*					P	
Mountain Chickadee *Parus gambeli*		W				W
Wrens (Troglodytidae)						
Rock Wren *Salpinctes obsoletus*				P		
Thrashers (Mimidae)						
Sage Thrasher *Oreoscoptes montanus*			S		S	
Thrushes (Turdidae)						
Swainson's Thrush *Catharus ustulatus*		T				T
Hermit Thrush *Catharus guttatus*		T				T
Robin *Turdus migratorius*		T				TW
Kinglets (Polioptilidae)						
Blue-Gray Gnatcatcher *Polioptila caerulea*			S			
Ruby-crowned Kinglet *Regulus calendula*		T				T
Shrikes (Laniidae)						
Loggerhead Shrike *Lanius ludovicianus*				P		
Northern Shrike *Lanius excubitor*			W	W		W
Vireos (Vireonidae)						
Warbling Vireo *Vireo gilvus*		T				T
Solitary Vireo *Vireo solitarius*		T			S	
Warblers (Parulidae)						
Orange-crowned Warbler *Vermivora celata*		T				T
Yellow Warbler *Dendroica petechia*		ST				T
Yellow-rumped Warbler *Dendroica coronata*		T				T
House Sparrows (Ploceidae)						
House Sparrow *Passer domesticus*		P				P

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Table 1.6.1-2. Common and typical species of birds of the Nevada/Utah study area (page 3 of 3).

SPECIES	AQUATIC	RIPARIAN	BIG SAGE	SHADSCALE AND GREASEWOOD	PINYON-JUNIPER WOODLAND	TREE PLANTATIONS
Blackbirds (Icteridae)						
Redwing *Agelaius phoeniceus*	ST	ST				T
Northern Oriole *Icterus galbula*		S	S			S
Brewer's Blackbird *Euphagus cyanocephalus*		ST	P			P
Brown-headed Cowbird *Molothrus ater*		ST				ST
Tanagers (Thraupidae)						
Western Tanager *Piranga ludoviciana*		T				T
Sparrows and Finches (Fringillidae)						
Black-headed Grosbeak *Pheucticus melanocephalus*		ST				T
House Finch *Carpodacus mexicanus*		P	P			P
American Goldfinch *Spinus tristis*		P				P
Green-tailed Towhee *Chlorura chlorura*			ST		ST	
Lark Sparrow *Chondestes grammacus*			S	S		
Black-throated Sparrow *Amphispiza bilineata*			S	S		
Sage Sparrow *Amphispiza belli*			S	S	S	
Dark-eyed (Oregon) Junco *Junco hyemalis*		TW	TW		TW	TW
Brewer's Sparrow *Spizella breweri*			ST		S	
White-crowned Sparrow *Zonotrichia leucophrys*		T	T	T	T	T
Song Sparrow *Melospiza melodia*	P	P				P

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P = Permanent resident

S = Summer only

T = Spring/Fall Transient

W = Winter Only

Table 1.6.1-3. Herpetofauna of the High Plains of Texas and New Mexico by habitat type.

COMMON NAME	SPECIES NAME	HABITAT TYPE						
		RIPARIAN	CANYON UPLAND	DESERT SCRUB	DUNE SCRUB[1]	MESQUITE GRASSLAND	SHORTGRASS	AGRICULTURE
Salamanders, Frogs and Toads								
Tiger Salamander	*Ambystoma tigrinum*	X						
Plains Spadefoot	*Scaphiopus bombifrons*	X	X	X		X	X	
Western Spadefoot	*S. hammondi*	X	X				X	
Woodhouses Toad	*Bufo woodhousei*	X						
Great Plains Toad	*B. cognatus*	X	X	X		X	X	X
Green Toad	*B. debilis*	X				X		
Red-spotted Toad	*B. punctatus*	X	X	X				
Bullfrog	*Rana catesbeiana*	X						
Plains Leopard Frog	*R. lairi*	X					X	X
Turtles								
Common Snapping Turtle	*Chelydra serpentina*	X						
Yellow Mud Turtle	*Kinosternon flavescens*	X					X	
Pond Slider	*C. scripta*	X						
Ornate Box Turtle	*Terrapene ornata*			X		X	X	
Lizards								
Collared Lizard	*Crotaphytus collaris*		X				X	
Round-tailed Horned Lizard	*Phyronosoma modestum*		X	X	X			
Lesser Earless Lizard	*Holbrookia maculata*		X	X	X	X		
Side-blotched Lizard	*Uta stansburiana*		X	X	X	X		
Eastern Fence Lizard	*S. undulatus*		X	X	X	X	X	
Great Plains Skink	*E. obsoletus*	X		X		X		
Texas Spotted Whiptail	*C. gularis*		X	X		X		
Checkered Whiptail	*C. tesselatus*		X	X				
Chihuahua Whiptail	*C. exsanguis*		X	X				
Snakes								
Checkered Garter Snake	*T. marcianus*	X				X		
Texas Blind Snake	*L. dulcis*			X	X	X	X	
Western Hognose Snake	*Heterodon nasicus*				X	X		
Prairie Ring-necked Snake	*Diadophis punctatus*	X						
Yellow-bellied Racer	*Coluber constrictor*		X			X	X	
Coachwhip	*Masticophis flagellum*	X	X	X		X		
Glossy Snake	*Arizona elegans*			X		X	X	
Bullsnake	*Pituophis melanoleucas*	X	X	X	X	X	X	
Great Plains Rat Snake	*Elaphe guttata*	X						
Central Plains Milk Snake	*Lampropeltis triangulum*			X		X	X	
Kingsnake	*L. getulus*	X	X	X	X	X		
Great Plains Ground Snake	*Sonora episcopa*			X		X		
Long-nosed Snake	*Rhinocheilus lecontei*		X	X	X	X		
Plains Black-headed Snake	*Tantilla nigriceps*	X	X	X		X	X	
Texas Night Snake	*Hypsiglena torquata*		X	X		X		
Desert Massasauga	*Sistrurus catenatus*		X	X	X	X	X	
Prairie Rattlesnake	*Crotalus viridis*	X	X	X	X	X	X	
Western Diamondback Rattlesnake	*C. atrox*	X	X	X	X	X	X	

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[1]Includes shinnery-oak and sand sage dune.

Table 1.6.1-4. Common or typical avifauna of the High Plains of Texas and New Mexico by status and habitat type (page 1 of 3).

COMMON NAME	SPECIES TYPE	STATUS	HABITAT TYPE						
			RIPARIAN	CANYON UPLAND	DESERT SCRUBS	DUNE SCRUB[1]	MESQUITE GRASS	SHORTGRASS	AGRICULTURE
Loons and Grebes									
Eared Grebe	*Podiceps nigricollis*	MWB	X						
Pie-billed Grebe	*Podilymbus podiceps*	MYL	X						
Herons, Egrets and Ibis									
Great Blue Heron	*Ardea herodias*	YL	X						
Snowy Egret	*Leucophoyx thula*	MB	X						
Black-crowned Night Heron	*Nycticorax nycticorax*	YL	X						
Swans, Ducks and Geese									
Canada Goose	*Branta canadensis*	MFW	X						
Snow Goose	*Chen hyperborea*	MFW	X						
Mallard	*Anas platyrhynchos*	MSSuFW	X						
Gadwall	*A. strepera*	MWB	X						
American Widgeon	*A. americana*	MYLB	X						
Pintail[1]	*A. acuta*	MYLB	X						
Green-winged Teal	*A. crecca carolinense*	MSYL	X						
Blue-winged Teal	*A. discors*	MYLB	X						
Cinnamon Teal	*A. cyanoptera*	MSSuWB	X						
Shovler	*A. clypeata*	MSSuW	X						
Redhead	*Aythya americana*	WSFW	X						
Canvasback[2]	*A. valisineria*	MSFW	X						
Lesser Scaup	*A. affinis*	MSFW	X						
Bufflehead	*Bucephala albeola*	MWS	X						
Ruddy Duck	*Oxyura jamaicensis*	MSFW	X						
Hawks, Eagles, and Vultures									
Turkey Vulture	*Cathartes aura*	MSSuB	X					X	
Sharp-shinned Hawk[2]	*Accipiter striatus*	MSuW	X						
Cooper's Hawk[2]	*A. cooperi*	MYL	X	X	X		X		
Red-tailed Hawk	*Buteo jamaicensis*	MYLB	X	X			X	X	
Rough-legged Hawk	*B. lagopus*	MFW				X		X	
Ferruginous Hawk	*B. regalis*	MYLB	X	X	X	X	X	X	
Swainson's Hawk[2]	*B. swainsoni*	MYLB	X	X	X	X	X	X	
Golden Eagle	*Aquila chrysaetos*	MYLB	X					X	
Marsh Hawk[2]	*Circus cyaneus*	MSuFWB	X		X	X	X	X	
Prairie Falcon[2]	*Falco mexicanus*	MSWB	X					X	
American Kestrel[2]	*F. sparverius*	MYLB	X	X	X	X	X	X	
Gallinaceous Birds									
Bobwhite	*Colinus virginianus*	YLB	X	X					X
Scaled Quail	*Callipepla squamata*	YLB	X	X	X	X	X	X	
Ring-necked Pheasant	*Phasianus colchicus*	YLB	X	X					X
Rio Grande Turkey	*Meleagris gallopavo*	YLB		X					
Cranes, Rails and Gallinules									
Sandhill Crane	*Grus canadensis*	MSuFW	X						
American Coot	*Fulica americana*	MYLB	X						
Shorebirds									
Snowy Plover	*Charadrius alexandrinus*	MSuB	X						
Killdeer	*C. vociferus*	MYLB	X						X
Common Snipe	*Capella gallinago*	MSFW	X						
Long-billed Curlew	*Numenius americanus*	MSuFWB	X					X	
Greater Yellowlegs	*Tringa melanoleuca*	MSSuW	X						
Baird's Sandpiper	*Calidris bairdii*	MSSuF	X						
Least Sandpiper	*C. minutilla*	MSW	X						
Western Sandpiper	*C. mauri*	MSSuF	X						
American Avocet	*Recurvirostra americana*	MSuFB	X						
Black-necked Stilt	*Himantopus mexicanus*	MSSuFB	X						
Wilson's Phalarope	*Steganopus tricolor*	MSSuFB	X						
Gulls and Terns									
Ring-billed Gull	*Larus delawarensis*	MSuWB	X						
Black Tern[2]	*Chilidonias niger*	MSSuF	X						
Pigeons and Doves									
Rock Dove (Pigeon)	*Columba livia*	YLB	X						X
Mourning Dove	*Zenaida macroura*	YLB	X	X	X		X	X	X

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Table 1.6.1-4. Common or typical avifauna of the High Plains of Texas and New Mexico by status and habitat type (page 2 of 3).

COMMON NAME	SPECIES NAME	STATUS	HABITAT TYPE						
			RIPARIAN	CANYON UPLAND	DESERT SCRUB	DUNE-SCRUB	MESQUITE GRASS	SHORTGRASS	AGRICULTURE
Cuckoos									
Yellow-billed Cuckoo	*Coccyzus americanus*	MSuFB	X						
Roadrunner	*Geococcyx californianus*	YLB	X	X	X	X		X	
Owls									
Barn Owl	*Tyto alba*	YL	X	X	X		X		X
Great Horned Owl	*Bubo virginianus*	YLB	X	X	X		X		
Burrowing Owl	*Athene cunicularia*	YLB	X			X		X	
Goatsuckers and Swifts									
Common Nighthawk	*Chordeiles minor*	MSSuB	X					X	X
White-throated Swift	*Aeronautes saxatalis*	MSFWB	X						
Woodpeckers									
Common Flicker	*Colaptes auratus*	YL	X	X	X		X		
Yellow-bellied Sapsucker	*Sphyrapicus varius*	MFW							
Ladder-backed Woodpecker	*Picoides scalaris*	YLB	X	X	X		X		
Flycatchers									
Western Kingbird	*Tyrannus verticalis*	MSSuFB	X		X		X		
Say's Phoebe	*Sayornis sayus*	MYL	X	X	X		X		
Western Flycatcher	*Empidonax difficilis*	MSF	X						
Western Wood Peewee	*Contopus sordidulus*	MSSuFB	X						
Larks									
Horned Lark	*Eremophila alpestris*	YLB			X		X	X	
Swallows									
Rough-winged Swallow	*Stelgidopteryx ruficollis*	MSuB	X						
Barn Swallow	*Hirundo rustica*	MSSuFB	X						X
Crows and Jays									
Blue Jay	*Cyanocitta cristata*	SuFW		X					
Steller's Jay	*C. stelleri*	MSW	X						
Scrub Jay	*Aphelocoma coerulescens*	MSW	X						
White-necked Raven	*Corvus cryptoleucus*	YLB	X		X	X	X	X	
Common Crow	*C. brachyrhychos*	MSW		X		X	X		X
Pinyon Jay	*Gymnorhinus cyanocephalus*	MSFW	X	X					
Wrens									
House Wren	*Troglodytes aedon*	MSFB	X						
Bewick's Wren	*Thyromanes bewickii*	MSSuWB	X	X	X		X		
Longbilled Marsh Wren	*Cistothorus palustris*	MFW							
Rock Wren	*Salpinctes obsoletus*	MSuWB	X	X					
Mockingbird, Catbirds and Thrashers									
Mockingbird	*Mimus polyglottos*	MYLB	X						
Sage Thrasher	*Oreoscoptes montanus*	MSFW	X		X		X		
Thrushes and Bluebirds									
Robin	*Turdus migratorius*	MYL	X						X
Swainson's Thrush	*Catharus ustulata*	MFW	X						
Eastern Bluebird	*Sialia sialis*	MYL	X						
Mountain Bluebird	*S. currucoides*	MSFW	X	X	X		X		
Gnatcatchers and Kinglets									
Blue-gray Gnatcatchers	*Polioptila caerulea*	MSuFWB		X			X		
Ruby-crowned Kinglet	*Regulus calendula*	MSFW	X						

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Table 1.6.1-4. Common or typical avifauna of the High Plains of Texas and New Mexico by status and habitat type (page 3 of 3).

COMMON NAME	SPECIES NAME	STATUS	HABITAT TYPE						
			RIPARIAN	CANYON UPLAND	DESERT SCRUBS	DUNE-SCRUB[a]	MESQUITE GRASS	SHORTGRASS	AGRICULTURE
Pipits									
Water Pipit	*Anthus spinoletta*	MSFW	X						
Sprague's Pipit	*A. spraguei*	MSFW							X
Waxwings									
Cedar Waxwing	*Bombycilla cedrorum*	MSFW	X		X		X		
Shrikes									
Loggerhead Shrike	*Lanius ludovicianus*	YLB	X	X	X	X	X		
Starling									
Starling	*Sturnus vulgaris*	MYL	X						
Vireos									
Warbling Vireo	*Vireo gilvus*	MSuF	X						
Warblers									
Black and White Warbler	*Mniotilta varia*	MSSuF	X	X					
Nashville Warbler	*Vermivora ruficapilla*	MSF	X						
Yellow Warbler	*Dendroica petechia*	MSSuB	X	X					
Yellow-rumped Warbler[c]	*D. coronata*	MSFW	X	X					
MacGillivary's Warbler	*Oporornis tolmiei*	MSF	X						
Yellowthroat	*Geothlypis trichas*	MSSuFB	X						
Wilson's Warbler	*Wilsonia pusilla*	MSF	X						
Weaver Finches									
House Sparrow	*Passer domesticus*	YLB	X						
Meadowlark									
Eastern Meadowlark	*Sturnella magna*	YLB	X				X	X	
Western Meadowlark	*S. neglecta*	YLB	X		X	X	X	X	
Blackbirds and Orioles									
Red-winged Blackbird	*Agelaius phoeniceus*	YLB	X						X
Northern Oriole[b]	*Icterus galbula*	MSuB							
Brewer's Blackbird	*Euphagus cyanocephalus*	MYL	X						X
Great-tailed Grackle	*Quiscalus mexicanus*	YL	X						
Common Grackle	*Q. quiscula*	MSuW	X	X					
Brown-headed Cowbird	*Molothrus ater*	MYLB	X						X
Grosbeaks, Finches, Sparrows and Buntings									
Blue Grosbeak	*Guiraca caerulea*	MSSuFB	X	X					
Lazuli Bunting	*Passerina amoena*	MSSuF	X						
Dickcissel	*Spiza americana*	MSSuFB	X					X	
Evening Grosbeak	*Hesperiphona vespertina*	MSFW	X						
House Finch	*Carpodacus mexicanus*	YLB	X	X		X			X
Pine Siskin	*Carduelis pinus*	MYL	X						
American Goldfinch	*C. tristis*	MSuW	X	X					
Lesser Goldfinch	*C. psaltria*	YL	X	X					
Rufous-sided Towhee	*Pipilo erythrophthalmus*	YL	X	X					
Lark Bunting	*Calamospiza melanocorys*	MSFWB	X		X		X	X	
Lark Sparrow	*Chondestes grammacus*	MSSuB	X	X	X	X	X	X	
Cassin's Sparrow	*Aimophila cassinii*	YLB			X	X	X	X	
Dark-eyed Junco	*Junco hyemalis*	MSFW	X						
Tree Sparrow	*Spizella arborea*	MFW	X	X			X		
Clay-colored Sparrow	*S. pallida*	MSuF	X						
Brewer's Sparrow	*S. breweri*	MSSuWB	X		X	X	X		
White-crowned Sparrow	*Zonotrichia leucophrys*	MYL	X	X			X		
White-throated Sparrow	*Z. albicollis*	MSFW	X		X				
Lincoln's Sparrow	*Melospiza lincolnii*	MSFW	X	X					
Song Sparrow	*M. melodia*	MYL	X						
Chestnut-collared Longspur	*Calcarius ornatus*	MSFW						X	

[a] Includes shinnery-oak and sand sage type.
[b] American Ornithology Union 3.1 re-listed.
[c] Includes Audubon's warbler.

M = Migratory (into, out of, or through area)
B = Breeding record in area
S = Spring records
Su = Summer records
F = Autumn records
W = Winter records
Y = Records throughout year

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Table 1.6.1-5. Common or typical mammalian fauna of the High Plains of Texas and New Mexico by habitat type.

COMMON NAME	SPECIES TYPE	HABITAT TYPE						
		RIPARIAN	CANYON UPLAND	DESERT SCRUB	DUNE SCRUB*	MESQUITE GRASS	SHORTGRASS	AGRICULTURE
Opossum								
Opossum	*Didelphis virginianus*	X	X					
Shrews								
Desert Shrew	*Notiosorex crawfordi*		X	X				
Bats								
Cave Myotis	*Myotis velifer*	X						
Long-legged Myotis	*M. volans*	X						
Western Pipistrelle	*Pipistrellus hesperus*	X						
Townsend's Big-eared Bat	*Plecotus townsendi*	X						
Pallid Bat	*Antrozous pallidus*	X						X
Brazilian Freetailed Bat	*Tadarida brasilensis*	X						X
Big Free-tailed Bat	*T. macrotis*	X						
Pocketed Free-tailed Bat	*T. femorosacca*	X						
Armadillos								
Armadillo	*Dasypus novemcinctus*	X						
Rabbits								
Black-tail Jackrabbit	*Lepus californicus*	X		X	X		X	
Desert Cottontail[3]	*Sylvilagus audubonı*	X	X	X	X	X		X
Eastern Cottontail[3]	*S. floridanus*	X					X	X
Rodents								
Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*						X	X
Spotted Ground Squirrel	*S. spilosoma*		X		X	X	X	
Black-tailed Prairie Dog	*Cynomys ludovicianus*					X	X	
Plains Pocket Gopher	*Geomys bursarius*	X			X	X	X	X
Desert Pocket Gopher	*G. arenarius*		X	X				
Yellow-faced Pocket Gopher	*Pappogeomys castanops*						X	X
Silky Pocket Mouse	*Perognathus flavus*	X	X	X	X	X	X	
Plains Pocket Mouse	*P. flavescens*		X	X	X			
Merriam's Pocket Mouse	*P. Merriami*		X	X			X	
Hispid Pocket Mouse	*P. hispidis*	X	X	X				
Ord's Kangaroo Rat	*Dipodomys ordi*	X		X	X			
Beaver*	*Castor canadensis*	X						
Plains Harvest Mouse	*Reithrodontomys montanus*		X	X		X	X	X
Western Harvest Mouse	*R. megalotis*	X				X	X	X
Deer Mouse	*Peromuscus maniculatus*	X	X	X	X	X	X	X
White-footed Mouse	*P. leucopus*	X					X	X
Brush Mouse	*P. boylii*	X	X	X				
Rock Mouse	*P. difficilis*		X	X				
Northern Grasshopper Mouse	*Onychomus leucogaster*		X	X	X	X	X	
Hispid Cotton Rat	*Sigmodon hispidis*	X						X
Southern Plains Woodrat	*Neotoma micropus*	X		X				
White-throated Woodrat	*N. albigula*	X	X	X				
Norway Rat	*Rattus norvegicus*	X						X
House Mouse	*Mus musculus*	X						X
Porcupine	*Erethizon dorsatum*	X	X	X				
Carnivores								
Coyote*	*Canis latrans*	X	X	X	X	X	X	
Swift Fox	*Vulpes velox*						X	
Gray Fox[1]	*Urocyon cinereoargenteus*	X	X	X				
Racoon[1]	*Procyon lotor*	X	X	X				
Long-tailed Weasel[1]	*Mustela frenata*	X	X	X				
Badger[1]	*Taxidea taxus*				X		X	
Spotted Skunk	*Spilogale gracilis*	X						
Striped Skunk	*Mephitis mephitis*	X	X	X	X	X	X	
Bobcat[1,2]	*Felis rufus*	X	X	X			X	
Hoofed Animals								
Mule Deer[3]	*Odocoileus hemionus*	X	X	X	X			
White-tail Deer[3]	*O. virginianus*		X		X			
Pronghorn[3]	*Antilocapra americana*			X			X	

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[1]Regulated as a furbearer.

[2]Regulated as a predator.

[3]Regulated as a game animal.

*Includes shinnery oak and sand sage dunes.

Sources: Davis, 1974; Findley, et al., 1975

APPENDIX B (1.6.2)

Quantification of Direct Effects of M-X Deployment on Key Wildlife Species in Nevada/Utah

For proper impact analysis, it is necessary to quantify direct effects of M-X deployment on various biological resources. For the purpose of this analysis, direct effects are defined as destruction or disturbance of habitat as a direct result of construction and operation of the system. Population-induced effects (e.g. recreation) are considered indirect methodology for treating indirect effects in treated in a separate technical report (ETR-30). Excluded for this analysis are indirect effects associated with the DDA and DTN, and direct effects associated with the operating bases.

Each biological resource (e.g. pronghorn antelope) possesses one to several attributes (e.g. key range). The amount of direct effect can be quantified for some attributes (e.g. sage grouse leks) in terms of numbers of locations intersected by the project right-of-way. For other attributes (e.g. pronghorn antelope key range) the amount can be quantified in terms of area intersected by project right-of-way.

Long-Term Effects

For all resources, long-term effect is quantified as area (or number of locations) intersected by the project plotted on a 1:500,000 scale resource map. Because of the small scale of the map and plotting inaccuracies the quantity of disturbance is slightly exaggerated. This makes the analysis conservative from the standpoint of the resource.

Short-Term Effects

For pronghorn antelope, additional disturbance to behavior is assumed to extend 1 mile from activities during construction (see Figure 1.6.2-1).

This additional effect will diminish after construction ceases. For other resources, long-term and short-term effects are combined, since behavioral responses are less understood (e.g. sage grouse), or do not apply (e.g. protected fish).

List of Resource Attributes and Quantities Considered in This Analysis

The following is judged to be a list of significant biological resources significantly impacted directly by the construction and operation of the DDA and DTN in at least one hydrological subunit.

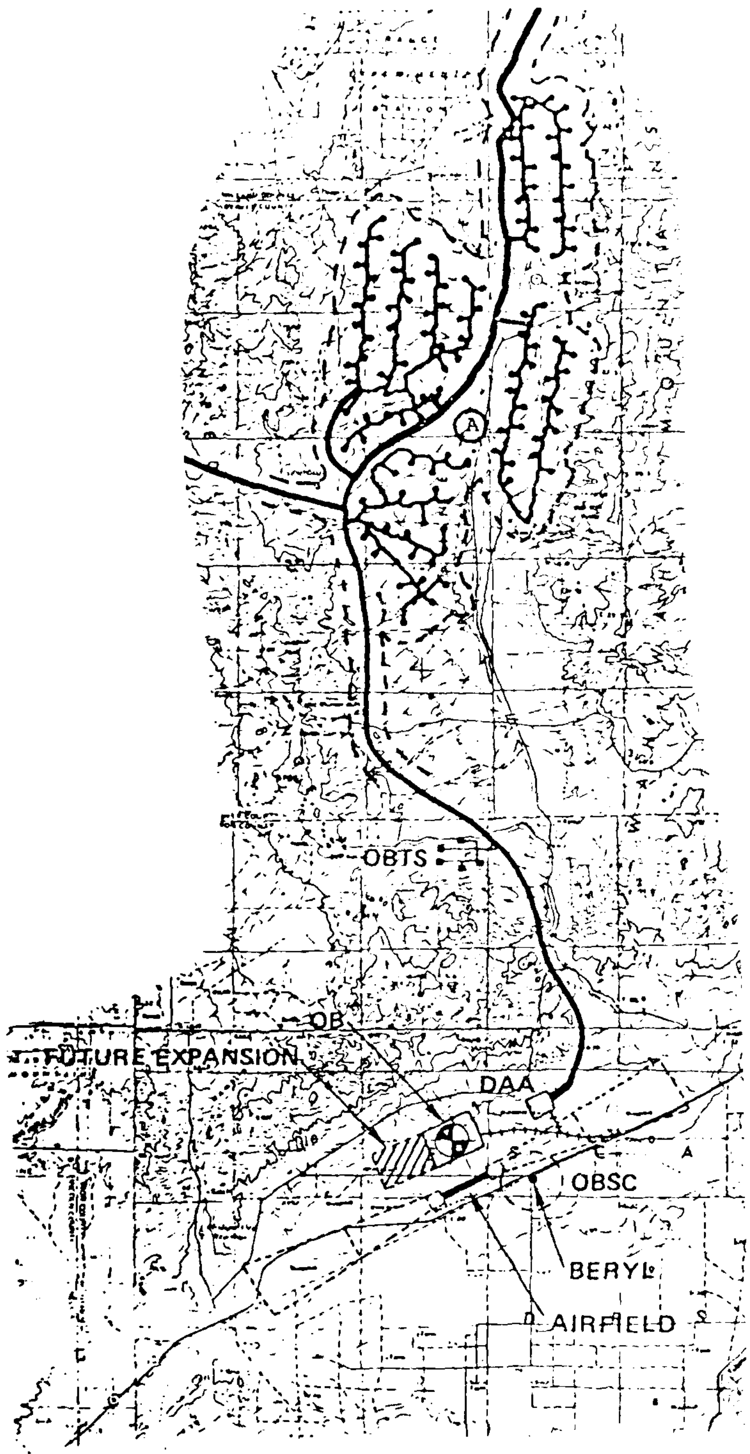

Figure 1.6.2-1. Heavy dashed lines enclose area assumed to be excluded to pronghorn antelope use during construction. Areas smaller than 5 sq mi and greater than 1 mi from nearest project element were also assumed to be excluded from pronghorn use. For example see (A) in Pine Valley.

RESOURCE	ATTRIBUTE	QUANTITY MEASURED	TABLE NO.
Pronghorn Antelope			1.6.2-1
	range	area	
	key range	area	
Sage Grouse			1.6.2-2
	leks	counts	
	brood-use areas	counts	
	wintering areas		
Mule Deer			1.6.2-3
	key range	area	
Waterfowl			1.6.2-4
	Rivers and streams	area	
	Playas and lakes	area	
Significant Natural Areas			

Analysis Strategy

The general strategy of this analysis was to determine the amount of each resource disturbed, expressed as a percent of the total resource abundance in each hydrologic subunit (Table 1.6.2-3). It was assumed that shelter locations could serve as a sample point of attribute areas disturbed by shelters, DTN, and cluster roads for resources such as pronghorn antelope (cf. ETN-100 and HDR-389). Shelter counts are then multiplied by a factor equal to the total disturbed area divided by the total number of shelters in each hydrologic subunit. The result represents the amount of each resource directly affected by the project during the long-term. Short-term effects were quantified by computer-planimetry of area within one mile of the project for pronghorn antelop.

It is not clear at this time how to combine the various effects on various resources to yield a combined effect in each hydrologic subunit. Until an acceptable methodology is worked out, impact analysis must address these effects separately. It is anticipated that further analysis of this data will be performed to support analysis of expected impacts to some of the resources considered here.

Table 1.6.2-1. Pronghorn antelope range, short term and long term (page 1 of 2).

RESOURCE	PRONGHORN ANTELOPE RANGE (Excluding key habitat)				
VALLEY	TOTAL ACREAGE	LONG-TERM DIRECT DISTURBANCE (acres)	PERCENT OF TOTAL	SHORT-TERM ONE-MILE DISTURBANCE (acres)	PERCENT OF TOTAL
Snake (4)	716,800	3,950	0.5	259,900	36.2
Pine (5)	115,500	550	0.5	28,900	25.0
White (6)	220,800	0	0	45,300	20.5
Fish Spring (7)	117,300	1,650	1.4	98,140	83.7
Dugway (8)	101,700	0	0	9,900	9.7
Government Creek (9)	175,300	50	< 0.1	44,114	25.2
Sevier/Dry Lake (46A)	267,100	3,800	1.4	89,400	33.5
Sevier Desert (46)	609,900	2,800	0.5	99,650	16.3
Milford (50)	387,500	0	0	0	0
Lund District (52)	186,200	0	0	0	0
Beryl-Junction (53)	144,300	0	0	0	0
Wah Wah (54)	251,950	4,950	2.0	235,900	93.6
Big Smokey (137A)	0	0	0	0	0
Kobeh (139)	134,450	1,050	0.8	73,281	54.5
Monitor (140A)	300	0	0	0	0
Monitor (140B)	16,200	0	0	0	0
Ralston (141)	98,400	1,900	1.9	79,050	80.3
Alkali Spring (142)	0	0	0	0	0
Cactus Flat (148)	187,350	0	0	10,650	5.7
Stone Cabin (149)	363,100	3,950	1.1	201,840	55.6
Little Fish Lake (150)	124,400	0	0	0	0
Antelope (151)	129,400	5,800	4.5	96,270	74.4
Newark (154)	0	0	0	0	0
Little Smokey (155A)	0	0	0	0	0
Little Smokey (155B)	0	0	0	0	0
Little Smokey (155C)	58,600	850	1.5	37,600	64.2
Hot Creek (156)	67,450	1,200	1.8	44,300	65.7
Penoyer (170)	89,600	0	0	0	0
Coal (171)	0	0	0	0	0
Garden (172)	0	0	0	0	0
Railroad S. (173A)	178,400	2,800	1.6	127,600	71.5
Railroad N. (173B)	335,700	2,400	0.7	150,900	45.0
Jakes (174)	0	0	0	0	0
Long (175)	0	0	0	0	0
Butte (178B)	0	0	0	0	0
Steptoe (179)	314,700	0	0	0	0
Cave (180)	0	0	0	0	0
Dry Lake (181)	0	0	0	0	0
Delamar (182)	0	0	0	0	0
Lake (183)	93,700	700	0.7	81,650	87.1
Spring (184)	282,400	100	< 0.1	5,800	2.1
Hamlin (196)	295,000	2,200	0.7	110,600	37.5
Patterson Wash (202)	89,700	500	0.6	71,250	79.4
White River (207)	0	0	0	0	0
Pahroc (208)	0	0	0	0	0
Pahranagat (209)	0	0	0	0	0
Coyote Springs (210)	0	0	0	0	0

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Table 1.6.2-1. Pronghorn antelope range, short term and long term (page 2 of 2).

RESOURCE	PRONGHORN ANTELOPE KEY HABITAT				
VALLEY	TOTAL ACREAGE	LONG-TERM DIRECT DISTURBANCE (acres)	PERCENT OF TOTAL	SHORT-TERM ONE-MILE DISTURBANCE (acres)	PERCENT OF TOTAL
Snake (4)	574,300	5,700	1.0	246,900	43.0
Pine (5)	196,000	3,500	1.8	126,400	64.5
White (6)	240,400	3,750	1.6	214,000	89.0
Fish Spring (7)	113,400	200	0.2	15,290	13.5
Dugway (8)	149,700	1,850	1.2	84,900	56.7
Government Creek (9)	153,000	500	0.3	42,900	28
Sevier Dry Lake (46A)	33,800	200	0.6	7,850	23.2
Sevier Desert (46)	206,500	3,500	2.0	105,604	51.1
Milford (50)	16,800	0	0	0	0
Lund District (52)	164,100	0	0	0	0
Beryl-Junction (53)	15,900	0	0	0	0
Wah Wah (54)	30,850	250	0.8	15,850	51.4
Big Smokey (137A)	0	0	0	0	0
Kobeh (139)	10,350	0	0	0	0
Monitor (140A)	0	0	0	0	0
Monitor (140B)	24,900	0	0	0	0
Ralston (141)	44,100	650	1.5	14,800	33.6
Alkali Spring (142)	0	0	0	0	0
Cactus Flat (148)	50,750	0	0	0	0
Stone Cabin (149)	67,600	550	0.8	21,167	31.3
Little Fish Lake (150)	31,500	0	0	0	0
Antelope (151)	0	0	0	0	0
Newark (154)	0	0	0	0	0
Little Smokey (155A)	0	0	0	0	0
Little Smokey (155B)	0	0	0	0	0
Little Smokey (155C)	0	0	0	0	0
Hot Creek (156)	26,300	350	1.3	25,500	97.0
Penoyer (170)	0	0	0	0	0
Coal (171)	0	0	0	0	0
Garden (172)	0	0	0	0	0
Railroad S. (173A)	63,000	1,100	1.7	46,700	74.1
Railroad N. (173B)	210,000	1,750	0.8	132,350	63.0
Jakes (174)	0	0	0	0	0
Long (175)	0	0	0	0	0
Butte (178B)	0	0	0	0	0
Steptoe (179)	58,900	0	0	0	0
Cave (180)	0	0	0	0	0
Dry Lake (181)	0	0	0	0	0
Delamar (182)	0	0	0	0	0
Lake (183)	87,300	1,250	1.4	74,900	85.8
Spring (184)	379,100	1,200	0.3	45,600	12.0
Hamlin (196)	58,000	1,000	1.7	45,950	79.2
Patterson Wash (202)	8,000	50	0.6	3,700	46.2
White River (207)	0	0	0	0	0
Pahroc (208)	0	0	0	0	0
Pahranagat (209)	0	0	0	0	0
Coyote Springs (210)	0	0	0	0	0

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Table 1.6.2-2. Sage grouse, combined short-term and long-term disturbance to range, leks, brood-use areas and wintering areas.

DDA RESOURCE		RANGE (Acres)			LEKS (No.)			BROOD-USE AREAS (Acres)			WINTERING GROUNDS		
VALLEY NAME	NO.	TOTAL	LOSS	%	TOTAL	LOSS	%	TOTAL	LOSS	%	TOTAL	LOSS	%
Snake	4	102,400	0	0	0	0	0	5	5	5	0	0	0
Pine	5	43,400	637	1.5	0	0	0	0	0	0	0	0	0
White	6	0	0	0	0	0	0	0	0	0	0	0	0
Fish Spring	7	0	0	0	0	0	0	0	0	0	0	0	0
Dugway	8	0	0	0	0	0	0	0	0	0	0	0	0
Government Creek	9	40,500	0	0	0	0	0	0	0	0	0	0	0
Sevier Desert	46	0	0	0	0	0	0	0	0	0	0	0	0
Sevier/Dry Lake	46A	0	0	0	0	0	0	0	0	0	0	0	0
Wah Wah	54	0	0	0	0	0	0	0	0	0	0	0	0
Big Smoky	137A	165,500	294	0.2	6	0	0	7	1	14.3	0	0	0
Kobeh	139	516,500	4,406	0.8	29	13	44.8	18	5	27.8	6.639	163	2.5
Monitor	140A	675.300	3,523	0.5	22	5	22.7	34	3	8.8	1.419	0	0
Ralston	141	83,000	0	0	1	0	2	8	0	0	0	0	0
Alkali Spring	142	0	0	0	0	0	0	0	0	0	0	0	0
Cactus Flat	148												
Stone Cabin	149	100,500	169	0.2	0	0	0	3	0	0	0	0	0
Antelope	151	294,000	4,861	1.6	2	2	100.0	2	1	0.5	5.689	0	0
Newark	154	348,000	1,814	0.5	13	2	15.4	10	0	0	6.823	0	0
Little Smoky	155	184,400	0	0	2	0	0	11	0	0	9.160	0	0
Hot Creek	156	179,000	0	0	0	0	0	1	0	0	0	0	0
Penoyer	170	116,000	0	0	0	0	0	0	0	[illegible]	0	0	0
Coal	171	0	0	0	0	0	0	0	0	0	0	0	0
Garden	172	114,000	1,053	0.9	0	0	0	3	2	66.7	0	0	0
Railroad	173	18,400	553	3.0	0	0	0	13	1	7.7	0	0	0
Jakes	174	167,000	590	0.4	9	3	33.3	23	0	0	0	0	0
Long	175	276,020	1,901	0.7	2	2	100.0	2	0	0	0	0	0
Butte	178	474,000	2,726	0.6	2	1	50.0	8	0	0	9.120	84	[illegible]
Cave	180	646,000	0	0	20	0	0	48	0	0	7.947	0	0
Dry Lake	181	18,200	0	0	0	0	0	0	0	0	0	0	0
Delamar	182	0	0	0	0	0	0	0	0	0	0	0	
Lake	183	194,687	2,660	1.4	1	1	100.0	7	4	57.1	0	0	
Spring	184	367,000	1,288	0.4	13	0	0	29	0	0	4.661	0	
Hamlin	196	312,000	4,737	1.5	0	0	0	3	2	66.7	0	0	0
Patterson Wash	202	93,800	0	0	0	0	0	0	0	0	0	0	0
White River	207	499,000	2,997	0.6	8	0	0	30	0	0	1.236	0	0
Pahroc	208	0	0	0	0	0	0	0	0	0	0	0	0
Pahranagat	209	0	0	0	0	0	0	0	0	0	0	0	0

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Table 1.6.2-3. Mule deer, combined short-term and long-term disturbance to key habitat.

DDA RESOURCE		KEY HABITAT DISTURBED (Acres)	TOTAL KEY HABITAT (Acres)	PERCENT
VALLEY NAME	NO.			
Snake	4	150	62,441	< 1
Pine	5	0	0	0
White	6	0	0	0
Fish Spring	7	0	0	0
Dugway	8	0	0	0
Government Creek	9	0	0	0
Sevier Desert	46	0	0	0
Sevier/Dry Lake	46A	0	0	0
Wah Wah	54	0	0	0
Big Smoky	137A	0	87,400	0
Kobeh	139	0	83,000	0
Monitor	140A	0	57,500	0
Ralston	141	0	25,700	0
Alkali Spring	142	0	0	0
Cactus Flat	148	0	5,100	0
Stone Cabin	149	0	56,800	
Antelope	151	100	53,100	< 1
Newark	154	50	111,600	< 1
Little Smoky	155	0	200	0
Hot Creek	156	0	59,800	0
Penoyer	170	0	38,100	0
Coal	171	0	37,400	0
Garden	172	160	2,100	8
Railroad	173	30	114,600	< 1
Jakes	174	0	66,000	0
Long	175	0	75,200	0
Butte	178	0	23,000	0
Cave	180	0	14,000	0
Dry Lake	181	0	41,000	0
Delamar	182	0	0	0
Lake	183	400	53,200	< 1
Spring	184	0	190,500	0
Hamlin	196	500	40,500	1
Patterson Wash	202	0	47,469	0
White River	207	0	133,632	0
Pahroc	208	0	0	0
Pahranagat	209	0	0	0

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Table 1.6.2-4. Waterfowl, combined short-term and long-term disturbance of rivers, springs, playas, and flatlands.

DDA RESOURCE		RIVER AND SPRING			PLAYA OR FLAT			TOTAL		
VALLEY NAME	NO.	POTENTIAL AREA	DISTURBED AREA	%	POTENTIAL AREA	DISTURBED AREA	%	TOTAL	DISTURBED	%
Snake	4	7,300	0	0	29,900	150	<1	37,200	150	<1
Pine	5									
White	6									
Fish Spring	7	0	0	0	21,200	0	0	21,200	0	0
Dugway	8	0	0	0	0	0	0	0	0	0
Government Creek	9	0	0	0	0	0	0	0	0	0
Sevier Desert	46	0	0	0	0	0	0	79,000	0	0
Sevier/Dry Lake	46A	0								
Wah Wah	54	0								
Big Smoky	137A	1,100	0	0	0	0	0	1,100	0	0
Kobeh	139	1,350	0	0	0	0	0	1,350	0	0
Monitor	140A	1,950	50	3	6,500	0	0	8,450	0	0
Ralston	141	0	0	0	13,200	250	2	13,200	250	2
Alkali Spring	142	5,000	100	2	0	0	0	5,000	100	2
Cactus Flat	148	4,100	0	0	0	0	0	4,100	0	0
Stone Cabin	149	0	0	0	0	0	0	0	0	0
Antelope	151	2,450	200	8	0	0	0	2,450	200	2
Newark	154	0	0	0	94,000	0	0	94,000	0	0
Little Smoky	155	2,600	100	3.7	0	0	0	2,600	100	3.7
Hot Creek	156	0	0	0	0	0	0	0	0	0
Penoyer	170	0	0	0	0	0	0	0	0	0
Coal	171	0	0	0	0	0	0	0	0	0
Garden	172	1,800	0	0	0	0	0	1,800	0	0
Railroad	173	6,200	0	0	9,100	100	1	15,300	100	1
Jakes	174								0	0
Long	175	1,000	0	0	0	0	0	1,000	0	0
Butte	178	0	0	0	0	0	0	0	0	0
Cave	180	0	0	0	0	0	0	0	0	0
Dry Lake	181	0	0	0	0	0	0	0	0	0
Delamar	182	0	0	0	0	0	0	0	0	0
Lake	183	0	0	o	4,350	50	1	4,350	50	1
Spring	184	4,200	0	0	23,500	0	0	27,700	0	0
Hamlin	196	0	0	0	0	0	0	0	0	0
Patterson Wash	202	0	0	0	0	0	0	0	0	0
White River	207	0	0	0	96,000	100	<1	96,000	400	<1
Pahroc	208									
Pahranagat	209									

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APPENDIX C (1.6.3)

Hunting Opportunities and Potential Impacts of M-X in the Nevada/Utah and Texas/New Mexico Potential Deployment Areas

Hunting, Nevada/Utah

Hunting big and upland game is an important form of recreation in Nevada and Utah. Hunting (or trapping for some furbearer species) waterfowl and furbearers is of less importance, primarily because of the limited resources in these states.

Big game hunting is closely regulated in Nevada and Utah. Hunters must apply for a permit by species and area in which they plan to hunt (game management areas published by state wildlife agencies). In Nevada and Utah, permits are awarded through drawings. Surveys of animal abundance are conducted each year to determine the number of permits to be issued for each management unit. Currently, hunter demand exceeds permit availability for most big game species (Tsukamoto, 1979a; Jense and Burruss, 1979). In Nevada, a hunter may apply for and obtain a deer permit every year. For pronghorn, however, a hunter may only apply for another permit five years after having received one. A similar restriction applies to obtaining elk and bighorn permits with the exception that if an animal is bagged, the hunter may not apply again for 10 years. In Utah, a hunter may apply for and obtain deer and elk permits every year. Pronghorn permits are restricted to one every three years, and only one bighorn sheep permit is allowed in a lifetime. Upland game hunting requires only a state hunting license. Open seasons and bag limits are established each year as determined by population and harvest trends. The taking of furbearers in Nevada requires a trapping license, and in Utah a license, permit, and tag are required for bobcats and kit foxes.

Population levels of most game animals have shown moderate to large population fluctuations over time as a result of numerous factors, particularly those related to human activities, and past harvest data reflect this. Figures 1.6.3-1, and 1.6.3-2 show past harvest data for big game animals in Nevada and Utah. Population levels were low for all these species in the early 1900s; implementation of management practices, along with strict hunting regulations, substantially increased the herds of most species. Deer harvest increased to a high in the early 1960s in both states, and then declined. This decline is probably related to changes in vegetation which have reduced the carrying capacity for deer. Hunting opportunities for pronghorn in both states and particularly for elk in Utah have increased considerably as a result of management practices. Pronghorn populations, however, are still low compared to historic levels because of range deterioration from overgrazing by domestic livestock, and habitat loss to agricultural and urban development. Because the species is not native to the state, elk hunting is restricted in Nevada; only one of the introduced populations is large enough to support hunting. Bighorn sheep hunting has been allowed only recently (1952 in Nevada and 1967 in Utah). State-wide population levels are still low, however, resulting in limited hunting opportunities.

Records for upland game, furbearer, and waterfowl harvest do not go back as far as they do for the big game species, which makes observation of long-term trends difficult. Upland game harvest has shown moderate to large annual fluctuations related to population trends with dove harvest generally increasing over the past 25 years in both states. Sage grouse harvest in Utah appears to have increased in the last 10 years as have harvests of fox and coyote in Nevada (Molini and Barngrover, 1979; Leatham and Bunnell, 1979).

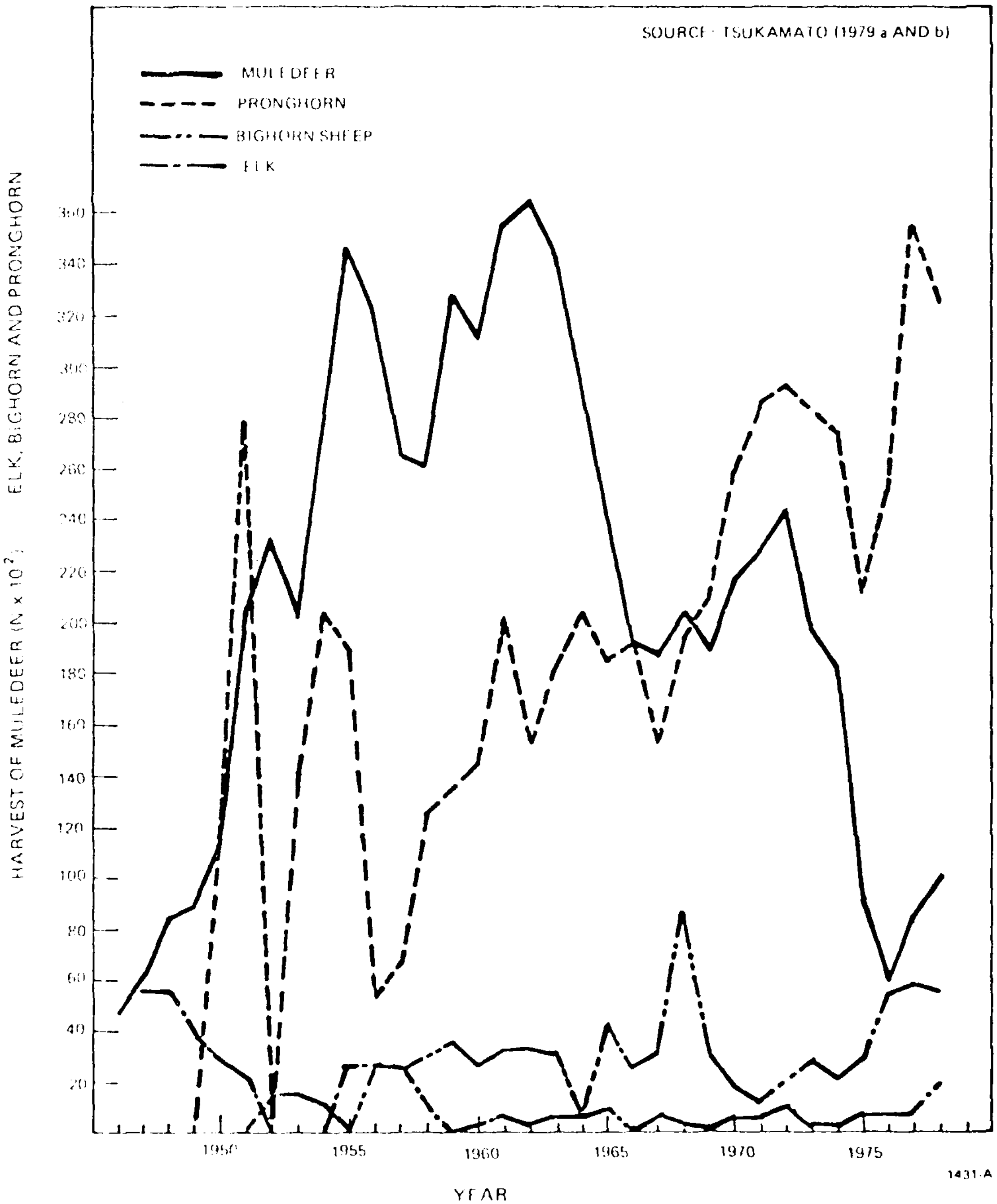

Figure 1.6.3-1. Big game harvest in Nevada.

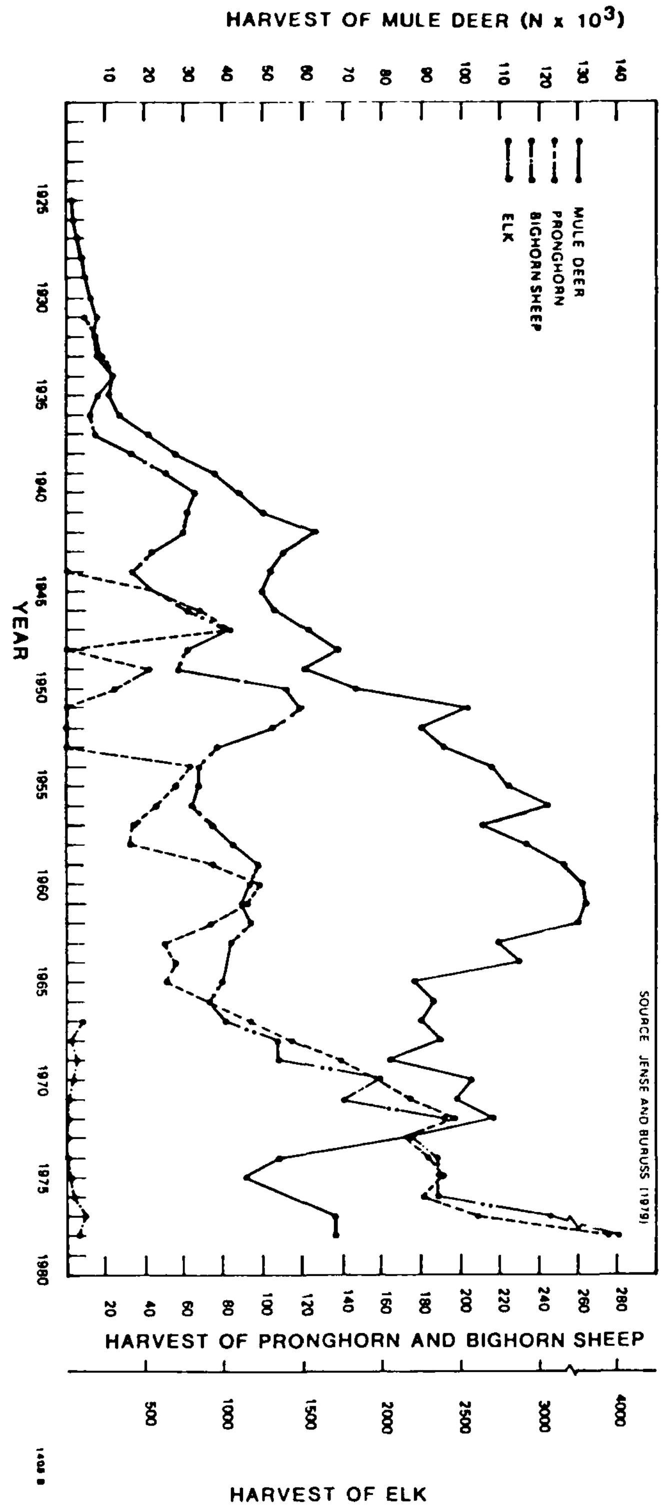

Figure 1.6.3-2. Big game harvest in Utah.

Big game harvest data in the study area for 1978 are presented in Tables 1.6.3-1 and 1.6.3-2 by management unit (Figures 1.6.3-3 through 1.6.3-7). These data indicate that mule deer provide most of the big game hunting opportunities in the study area. Approximately one half of the Nevada's state-wide harvest was taken in the study area compared to about 10 percent for western Utah. The large percentage in Nevada results from the high deer concentration in Elko and White Pine Counties. Most of the deer in Utah inhabit the mountains to the east of the study area. Pronghorn harvest in the study area was low compared to state totals. In Nevada, most (77 percent) pronghorn are harvested in Washoe and Humboldt counties in the northwestern part of the state, while most of the Utah harvest was from the south-central and northeastern parts of the state. About 75 percent of the Nevada bighorn harvest occurs in the study area, primarily in the mountains of the southern part of the state. In Utah, on the other hand, no bighorn were harvested in the study area. All elk hunting in Nevada took place in the Schell Creek Range just east of Ely. In Utah, elk are hunted primarily to the east of the study area, with less than 1 percent of the harvest in the West Desert area. Most of the Nevada mountain lion harvest was from the study area, and no data were available for harvest in Utah.

Hunting opportunities for mule deer and elk are similar in the Nevada and Utah portions of the study area. On a state-wide basis, however, Utah offers considerably more opportunities. Pronghorn hunting is similar for both states, within the study area and state-wide, while bighorn sheep hunting opportunities are greater in Nevada than in Utah.

Upland game harvest data are presented by county in Table 1.6.3-3. In Nevada, approximately 30 to 75 percent of the state-wide upland game harvest occurred within the study area. In the West Desert area of Utah, however, only harvest of dove (30 percent) and rabbit (47 percent) exceeded 20 percent of the state totals. Upland game species, with the exception of chukar and quail, are more abundant in Utah (state-wide and in study area) than in Nevada. Consequently, they provide more hunting opportunities in Utah.

Trapping and hunting of furbearers generally provide a much smaller recreational resource than either big or upland game. Recent harvest data shown in Table 1.6.3-4 indicate that opportunities are much greater in the Nevada portion of the study area than in Utah.

Waterfowl hunting provides a moderate recreational opportunity in Nevada, although most of the hunting areas are outside the potential M-X deployment area. Harvest data for 1978 are shown in Table 1.6.3-5. Approximately 30 percent of the Nevada state-wide harvest was taken in counties of the study area.

The state wildlife agencies are managing game species to maintain or enhance hunting opportunities. Demand, however, currently exceeds availability for bighorn sheep, pronghorn, and elk (in Nevada only). Projections for big game population levels to the year 2020 (Walstrom, 1973) indicate that hunting opportunities may increase for all except bighorn sheep. Projected populations of upland game species could support more hunting for all species except sage grouse. Furbearer hunting opportunities are expected to remain the same as at present, while those for waterfowl may decline. All of the above projections assume no additional habitat loss resulting from human activities.

Table 1.6.3-1. Pronghorn, bighorn sheep, and elk harvest by management unit for 1978 for those areas in the potential study area.

MANAGEMENT AREA[1]	PRONGHORN		BIGHORN SHEEP		ELK	
	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS
NEVADA						
10	10	11				
11	21	29			19	20
16	3	5				
20		Closed				
22		Closed				
23	6	10				
25A	7	7				
25B	4	5				
70			3	3		
71			2	5		
73			3	4		
74			4	7		
75			4	4		
76			6	6		
77			4	6		
78			6	6		
79			2	6		
80			8	12		
Sub Total	51		42			
STATE TOTAL	324	387	55	81	19	20
UTAH						
Cedar City	5	5				
Southwest Desert	29	35				
West Desert						
Riverbed	12	15				
Snake Valley	12	15				
4					17	20
18					1	10
Sub Total	58		0		18	
STATE TOTAL	276	320	7	23	4,093	33,564

731-1

[1]See Figures C-3 and C-6 for management area locations.
Source: Tsukamoto, 1979b; Jense and Burruss, 1979.

Table 1.6.3-2. Mule deer and mountain lion harvest by Management area for 1978 for those areas within the potential study area.

MANAGEMENT AREA[1]	MULE DEER[2]		MOUNTAIN LION	
	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS
NEVADA				
8			10	20
9			4	14
10	1,423	3,048	3	12
11	958	2,605	2	20
12	184	404	1	6
13	376	1,000		
14	421	942		
15	210	509	0	4
16	386	959	1	10
17	226	643	0	4
18	37	100	3	12
19			0	10
20	236	589	5	14
21	30	95	2	8
22	308	772	0	4
23	175	542	1	5
24	122	275	0	5
25	19	43	0	3
Sub Total	5,111		32	
STATE TOTAL	10,169	23,257	39	202
UTAH				
11	1,655	4,755		
12	985	3,341		
13	827	2,786		
14	388	1,571		
53	293	1,351		
54	566	1,927		
55	1,006	2,786		
56A	303	1,140		
56B	142	495		
56C	368	1,303		
62A	152	566		
62B	86	192		
62C	118	310		
Sub Total	6,889			
STATE TOTAL	68,282	216,951	N.D.[3]	N.D.

732-1

[1]Management areas for mule deer and mountain lion do not have the same boundaries although numbered the same. See Figs. C-4, C-5 and C-7.

[2]Harvest includes regular license, control permits, and primitive weapons.

[3]No data available.

Source: Tsukamoto, 1979a&b; Jense and Burruss, 1979.

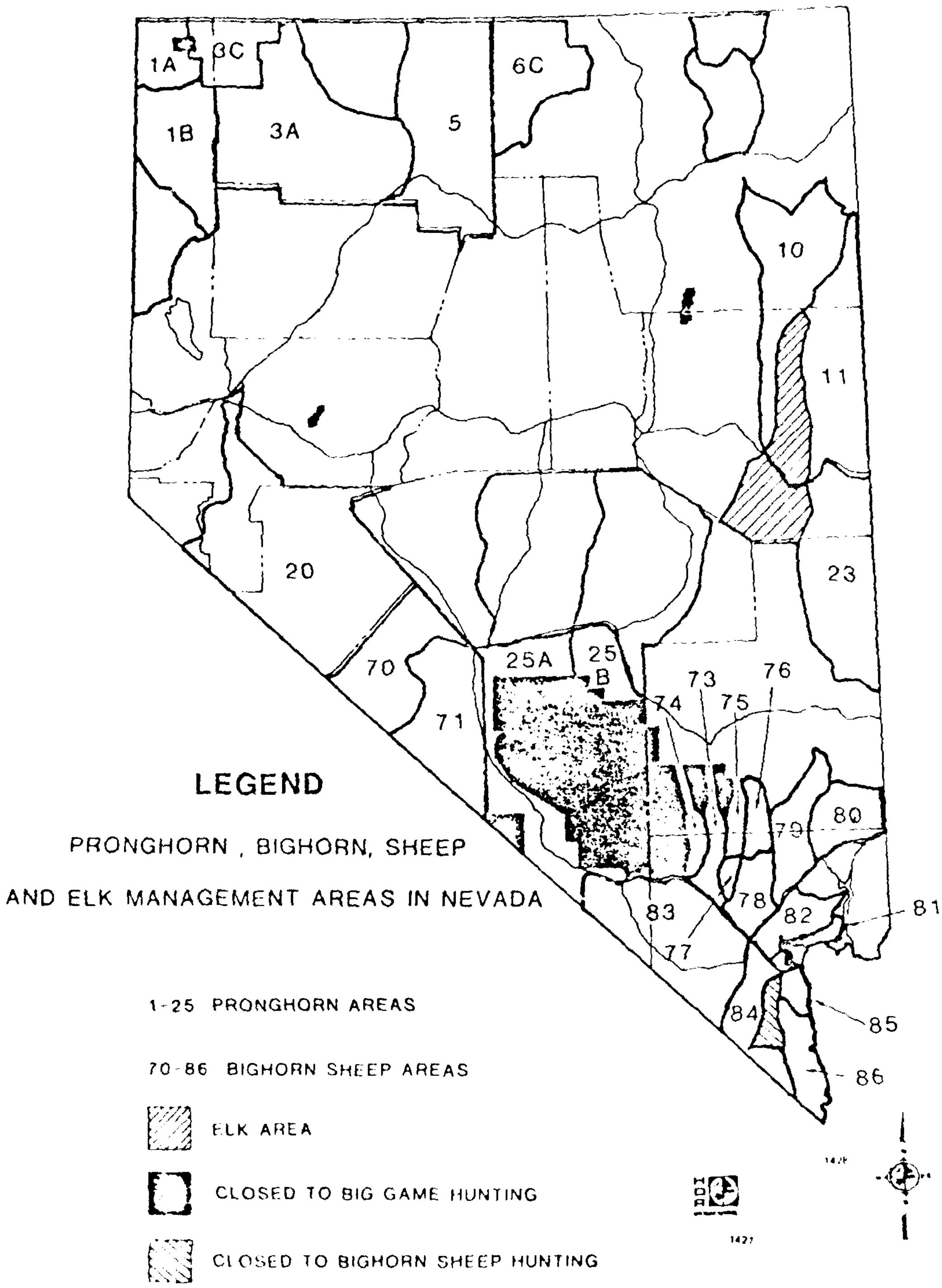

Figure 1.6.3-3. Pronghorn, bighorn sheep, and elk management areas in Nevada.

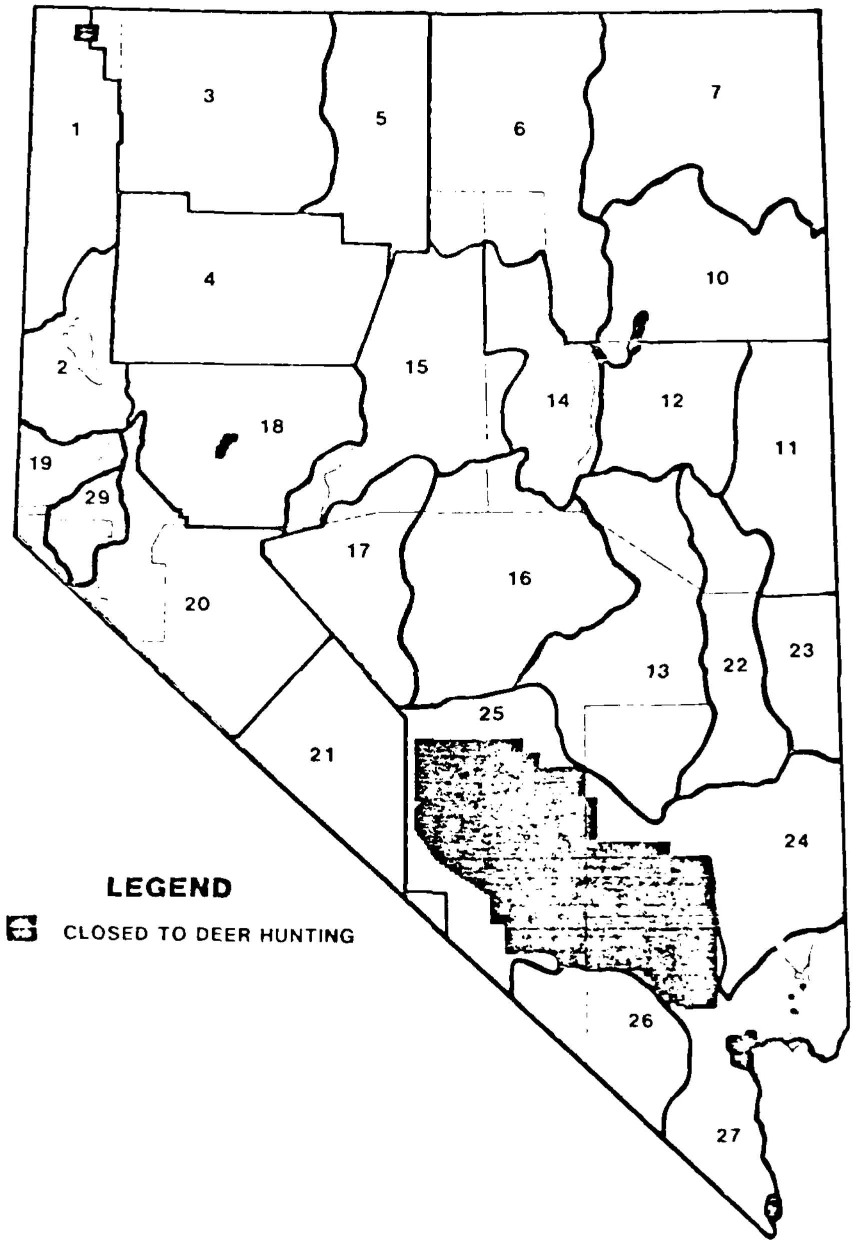

Figure 1.6.3-4. Mule deer management areas in Nevada.

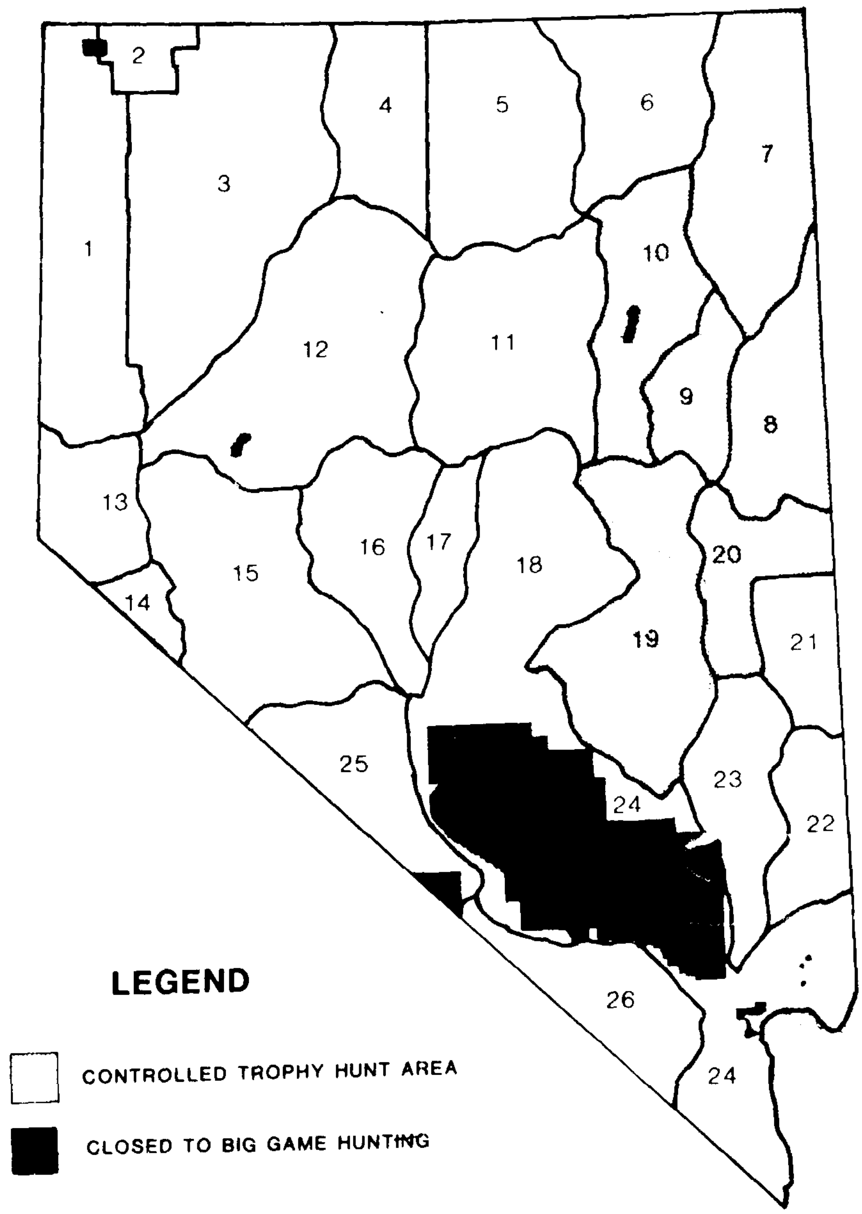

Figure 1.6.3-5. Mountain lion management areas in Nevada.

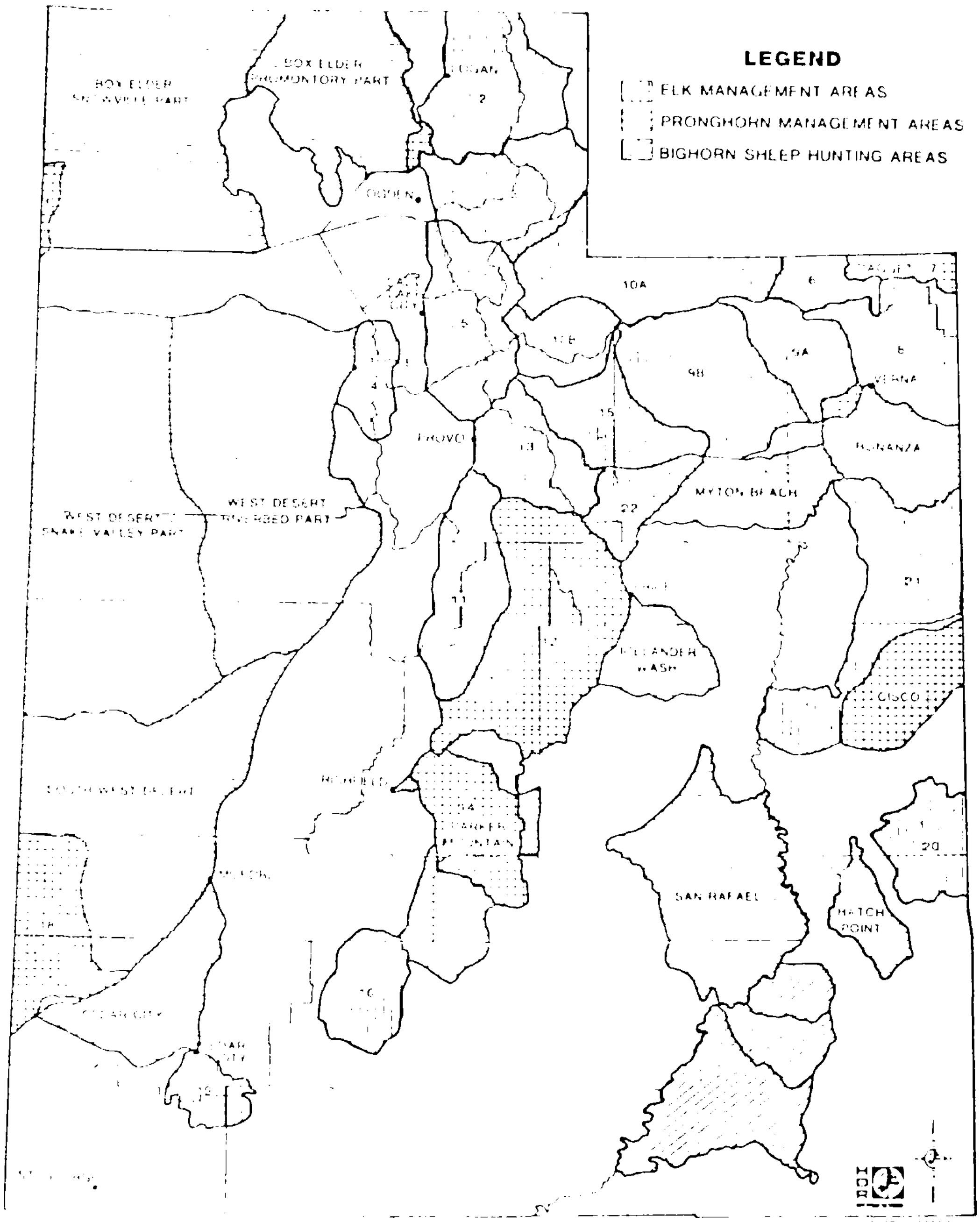

Figure 1.6.3-6. Elk, pronghorn, and bighorn sheep management areas in Utah.

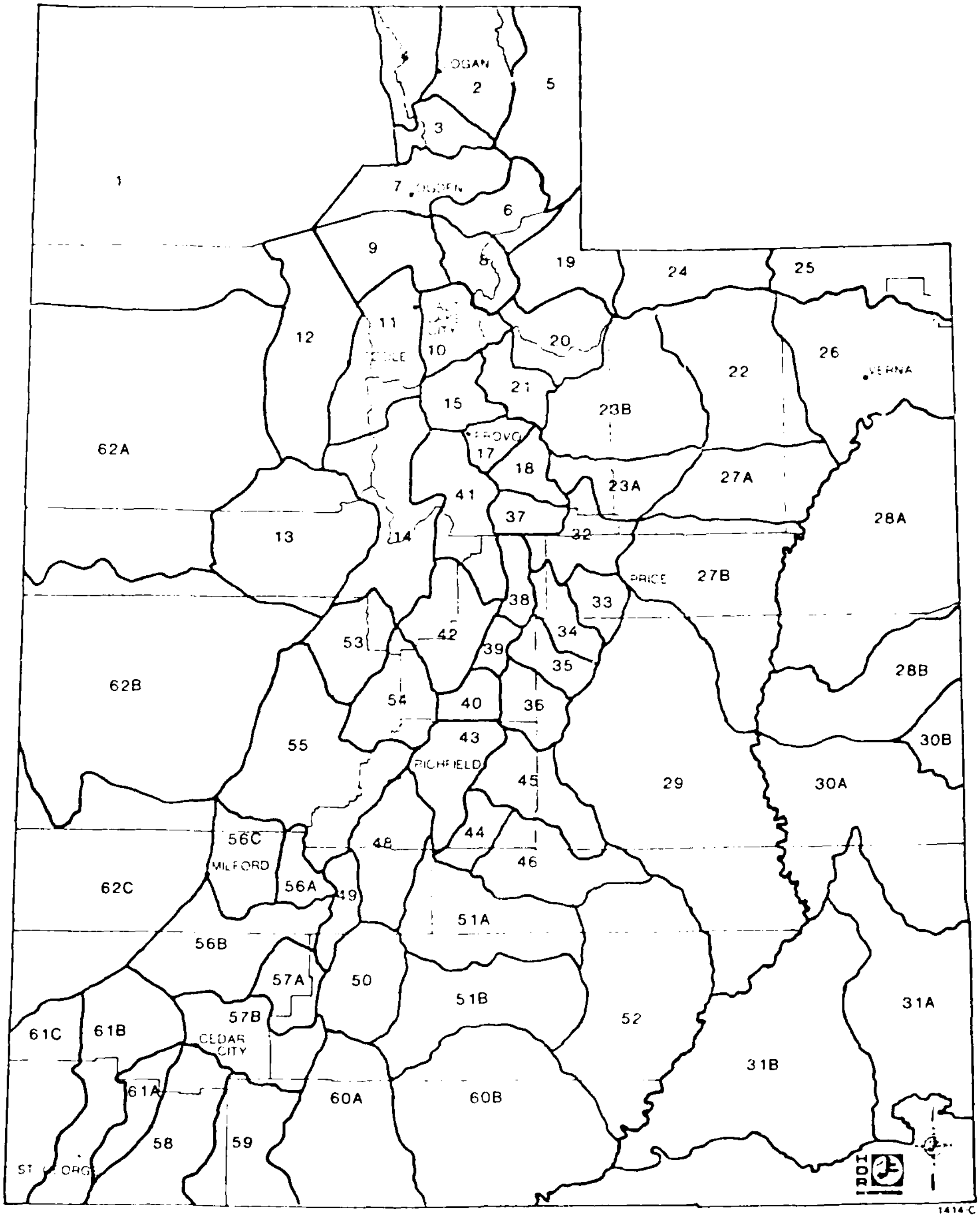

Figure 1.6.3-7. Mule deer management areas in Utah (numbers indicate herd units).

Table 1.6.3-3. Upland game harvest by county for 1978 for those counties in the potential study area.

STATE/ COUNTY	SAGE GROUSE		CHUKAR		QUAIL		DOVE		RABBIT		OTHER[1]	
	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS
NEVADA												
Clark	13	3	462	100	39,750	3,376	41,340	2,872	31,017	3,071	135	257
Elko	6,722	2,122	12,296	1,493	65	31	2,558	325	6,304	962	2,718	987
Esmeralda	0	1	2,470	349	40	5	753	92	603	91	0	0
Eureka	1,153	368	2,456	400	366	44	897	134	442	84	57	44
Lander	1,724	880	3,708	588	154	80	445	78	2,739	290	482	212
Lincoln	0	0	124	63	9,181	816	8,155	556	9,218	746	4	4
Mineral	244	152	4,375	442	274	50	1,373	127	2,075	284	48	14
Nye	1,939	720	7,743	1,166	3,342	478	13,325	1,114	6,925	983	77	75
White Pine	1,596	640	287	97	0	0	2,874	229	5,541	607	871	400
Sub Total	13,301		33,921		53,172		71,720		55,646		4,392	
STATE TOTAL	17,693	6,765	108,775	14,561	104,939	9,765	113,048	9,860	99,817	11,628	10,219	5,251
UTAH												
Beaver	360	174	0	11	0	0	6,465	317	3,562	345	1,721	496
Iron	300	229	0	11	0	26	16,132	997	4,564	673	3,303	1,102
Juab	240	153	580	277	120	17	34,065	2,112	20,684	1,555	3,282	1,433
Millard	40	44	981	301	80	78	35,606	1,922	6,648	790	10,367	3,351
Tooele	260	261	11,008	3,108	0	35	23,697	2,051	40,788	3,716	6,825	2,729
Sub Total	1,200		12,569		200		115,965		192,211		25,498	
STATE TOTAL	25,938	16,231	65,747	16,291	15,491	5,924	383,696	35,985	401,071	35,590	314,925	113,861

733

[1]Includes pheasant, blue and ruffed grouse, and Hungarian partridge.

Source: Molini and Barngrover, 1979; Leatham and Bunnell, 1979.

Table 1.6.3-4. Furbearer harvest by county in 1978 for those counties in the potential study area.

STATE/ COUNTY	BOBCAT		FOX[1]		COYOTE		MUSKRAT		BEAVER		OTHER[2]	
	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS
NEVADA												
Clark	526		457		527		200		0		91	
Elko	357		106		1,760		2,760		266		312	
Esmeralda	130		18		65		0		0		8	
Eureka	107		21		243		6		13		16	
Lander	353		27		297		0		6		46	
Lincoln	523		443		1,002		115		0		93	
Mineral	199		292		396		37		42		29	
Nye	308		230		389		1		1		79	
White Pine	211		136		416		1,192		13		60	
Sub Total	2,714		1,730		5,095		4,311		341		734	
STATE TOTAL	4,542	909	2,322	909	8,458	909	9,898	909	715	909	1,261	909
UTAH												
Beaver							N/A	N/A	1	0		
Iron							N/A	N/A	4	0		
Juab							N/A	N/A	8	3		
Millard							349	N/A	0	0		
Tooele							N/A	N/A	0	0		
Sub Total							349		13			
STATE TOTAL	N/A[3]	N/A	N/A	N/A	N/A	N/A	11,790	N/A	2,958	213	279	76

734

[1]Gray and kit fox.

[2]Includes ringtail cat, mink, otter, skunk, weasel, raccoon, and badger in Nevada; marten and mink in Utah.

[3]N/A = Not available in state harvest reports.

Source: Molini and Barngrover, 1979; Prevan, 1979.

Table 1.6.3-5. Waterfowl harvest data by county for the Nevada/Utah study area.

STATE COUNTY	DUCKS		GEESE		COOTS	
	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS	HARVEST	NUMBER HUNTERS
NEVADA						
Clark	8,369	1,262	44[illegible]	[illegible]	[illegible]	[illegible]
Elko	5,536	[illegible]	[illegible]	[illegible]		
Esmeralda	4[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Eureka	1,100	11[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lander	202	[illegible]		[illegible]		
Lincoln	6,51[illegible]	[illegible]38	[illegible]	[illegible]	[illegible]	[illegible]
Mineral	1,958	11[illegible]	4[illegible]	[illegible]		
Nye	[illegible],508	[illegible]	[illegible]	[illegible]		[illegible]
White Pine	[illegible],051	[illegible]		[illegible]		
Sub Total	30,280		[illegible]		[illegible]	
STATE TOTAL	104,840	12,45[illegible]	6,94[illegible]	[illegible]	[illegible]44	[illegible]
UTAH[1]						
Beaver						
Iron						
Juab						
Millard						
Tooele						
Sub Total						
STATE TOTAL						

[1]Data for Utah are presently not available.

Source: Molini and Barngrover, 1979.

Deployment of M-X in the Nevada/Utah study area could affect hunting through possible localized hunting restrictions during construction and through decreasing abundance of some game species as a result of habitat loss or reduced availability during construction and activities of inmigrating people such as increased hunting pressure, poaching, and habitat degradation. Habitat loss resulting from construction and operation (i.e., habitat removal for emplacement of facilities, loss of surface water through groundwater withdrawal, and behavioral avoidance of the project by game species), as described in ETR-15, could cause a decrease in abundance for several game species. The species most likely to be affected are those with much of their range located in valley bottoms and bajadas, such as pronghorn and sage grouse. Both the species are expected to be significantly affected by construction of the project (ETR-15).

Pronghorn are sensitive to human activities in their habitat and, consequently, are very likely to abandon areas where construction activities are ongoing. The animals thus displaced must locate suitable habitat or perish. The amount of habitat and associated numbers of animals potentially lost in this manner cannot be quantified at this time, since such calculations require a finalized project layout and construction schedule in addition to more detailed knowledge of pronghorn behavioral responses to large scale construction and operation activities, carrying capacity of adjacent areas, present population estimates, and demographic characteristics of each population, none of which are presently available. The areas of greatest impact potential in Nevada can be estimated, however, and are in the eastern part of the state from northern Steptoe Valley southeast through Spring, Snake, and Hamlin valleys.

For big game species other than pronghorn, the potential for project effects on population size is relatively small. Construction of roads and other communication/surveillance facilities as well as use of borrow pits could interfere with migrations of these animals along established migration routes or cause loss of habitat with a subsequent decline in population numbers.

Sage grouse abundances are likely to be decreased by construction activities, particularly if brood use areas, strutting grounds, or wintering grounds are disturbed or destroyed through emplacement of structures or by construction camps, equipment storage areas, and spoil disposal/storage areas. Impacts would be most likely in the northern part of the study area where sage grouse inhabit valleys. During operations, sage grouse should be able to utilize all habitat not greatly disturbed by construction. Thus, populations could recover to near pre-project levels in a few years and effects on hunting would be short-term.

Another potential effect of the project on hunting could occur if construction areas are closed to hunting for safety or other project-related reasons. This would not cause a decline in population levels, and could lead to a temporary increase. The extent and rate of population increase would depend on herd structures, habitat potential, and project impacts.

The influx of people predicted would result in a increased hunting demand for all game species. For the big game species (except deer and elk in Utah), increased demand would increase competition for the limited number of permits available. For other game animals, license availability would not limit hunting opportunities, but hunter success may decline as abundance decreases. Changes in management

policies, such as reductions in season length and bag limit, may be necessary to maintain resource levels that will support the hunting demand. The concentration of people in the vicinity of the operating bases would also cause increased hunting pressure in those areas, particularly for upland game species.

Another effect of population increases in remote areas would be an increase in poaching. This would likely be dispersed through the study area during construction and more localized around base locations during operations. In areas of low game animal abundance, poaching could have significant effects on population size, thus reducing hunting opportunities. All species could be affected in this manner, but antelope, mule deer, upland game, and waterfowl are the most likely to be measurably impacted. Potential effects on game population sizes, however, cannot be estimated because of the clandestine nature of poaching.

Dispersed recreation activities of the in-migrating people, other than hunting, could affect game animals through loss of habitat. For example, development of recreational facilities and camping adjacent to bighorn sheep watering sites could cause these animals to abandon that part of their range. This could result in a population decline if the carrying capacity of mountain ranges were reduced. To estimate the quantity of habitat lost in this manner would require estimates of induced population growth at specific locations and assumptions about the types and frequency of recreation activities in each location as well as information about animal abundance, sensitivity to various recreation activities, and habitat carrying capacity. Most of these factors are not presently available.

Assuming that all in-migrating people would have the same hunting preferences as the current population, and license (excluding big game) sales without the project would increase linearly with population, 2,125 licenses in Nevada and 4,107 in Utah would be bought by the in-migrating people during construction (in 1987). This would represent an increase of about 3 percent in each state. During operations (1994), license sales would increase by 1,373 in Nevada and 2,130 in Utah as a result of the project. This is an increase of 1.6 percent for Nevada and 1.3 percent for Utah. Increased revenue from sale of hunting licenses will provide funds for enhancing game habitat and/or research (Pittman-Robertson Act). This income, however, could not be used to offset the cost required to manage the resources for use by these additional people, such as providing game wardens and reintroducing animals in former range.

Hunting

Big game hunting is not an important activity in the Texas/New Mexico study area because big game are found mostly in habitats east or north of the area. For example, white-tailed deer population estimates range from zero in 13 High Plains counties of Texas, to 50 in Moore County, and 200 in Potter County. During late fall through early spring, mule deer concentrate to feed on wheat fields adjacent to Palo Duro Canyon, well to the east of the Texas and New Mexico project area. The imported aoudad (barbary sheep) also inhabits Palo Duro Canyon, and each fall a census of its population is conducted by helicopter from the upper reaches of the canyon in Randall County south to Floyd County. An annual aerial census of pronghorn shows that most of the antelope are found in the northern portion of the study area in Oldham, Hartley, Dallam and Potter counties. An inventory of the big game hunted in the High Plains Red River drainage area is shown in Table 1.6.3-6.

Table 1.6.3-6. Wildlife inventory estimates in the High Plains drainage area of the Red River.[1]

SPECIES	HABITAT (ACRES)	TOTAL POPULATION
White-Tailed Deer	55,850	30
Mule Deer	73,260	380
Aoudad (Barbary Sheep)	55,850	150
Pronghorn	—*	—*
Rio Grande Turkey	72,330	130
Ring-Necked Pheasant	1,239,770	47,850
Lesser Prairie Chicken	—*	—*
Quail	2,578,830	23,200
Mourning Dove	3,070,000	185,520
Fox Squirrel	23,040	90
Ducks	35,370	176,850
Geese	35,370	35,370

2817

[1]From U.S.D.A., Special Report, 1976.

*Numbers not available.

The data on small game show that the Rio Grande turkey population in the High Plains habitat area is insignificant and confined to Randall and Swisher counties. The introduced ring-necked pheasant population that thrives on the irrigated cropland of the High Plains is approximately one-tenth that of nonirrigated cropland. The lowest density of mourning dove in the High Plains is due to lack of cover and diversity of habitat. Fox squirrel habitat in the High Plains is insignificant. Rabbits are not considered as game animals in Texas and little census data exist concerning these species. The eastern cottontail is distributed widely and the black-tailed jackrabbit and desert cottontail increase in abundance in the open western areas.

Ponds and playas that remain wet for at least 60 percent of the time are considered habitat for waterfowl. Approximately 25 percent of the surface areas of lakes are effective waterfowl habitat. Even though geese utilize cultivated fields for feeding more so than ducks, and grain fields are important for hunting geese, the amount of water surface areas is the limiting factor. Canada geese are the most numerous with a few snow geese and a small number of white-fronted geese. It is estimated that there is approximately one goose per acre of suitable habitat in the High Plains, and that the area cannot meet the demand for goose hunting with the potential supply.

Hunting

Deployment of M-X in the Texas/New Mexico study area would affect hunting directly through habitat loss and possible localized hunting restrictions during construction. Indirect affects would result from activities of in-migrating people. Direct habitat loss resulting from construciton and operation (i.e., habitat removal for emplacement of facilities, and behavioral avoidance of the project) could cause a decrease in abundance for at least some game and furbearing species. The species most likely to be affected are pronghorn antelope, quail, waterfowl, mule deer, ring-necked pheasant, barbary sheep, coyote, grey and red fox, bobcat, and racoons.

Effects on hunting would result from influx of people into the project area, causing a concomitant increase in hunting demand for all game species. The sale of hunting licences to many of these people would provide the same with additional revenue. This income, however, is not expected to offset the cost required for the state wildlife agencies to manage these resources. Increased hunting pressure on game species may require changes in management, such as reductions in season length and bag limit, in order to maintain resource levels that will support the hunting demand. In the Texas portion of the area, hunting is a preferred recreational activity, often drawing hunters from other parts of the northern Texas region. The grain farms of the High Plains provide hunting grounds for ring-necked pheasant, dove, and quail.

Recreation activities of the in-migrating people could affect game animals through loss of habitat. For example, the development of recreational facilities, such as campsites or reservoirs, adjacent to or on the ranges of important species, could result in a population decline if the carrying capacity of the region were reduced.

The Pittman Robertson Act (Federal Aid in Wildlife Restoration Act) levies an 11 percent excise tax on sale of hunting gear. The program set up by this act matches state money on a 3:1 basis for purchase, development and/or improvement of wildlife lands or for research. As a result of project-related population growth, game habitat may be improved in or near the project area. The income, however, could not be used to offset the additional cost of managing the resources for use by the in-migrating people.

APPENDIX D (1.6.4)

Questionnaires used for impact analysis; pronghorn antelope, bighorn sheep, sage grouse, waterfowl, and lesser prairie chicken.

Consequences Which Are Specific to an
Individual Environmental Variable

Resource: Pronghorn

Disturbance: Habitat Loss

Pine Valley, Utah

1. To what extent will the effect alter the carrying capacity of the environment for the resource?

1	2	3	4	5
no change in carrying capacity		some reduction in carrying capacity		major reduction in carrying capacity

During construction, pronghorn are very likely to remain at least one mile from any construction activity. This will eliminate 25% of the existing pronghorn range and 65% of the key habitat in Pine Valley, resulting in a substantial reduction in carrying capacity. It is possible that construction water use (estimated at 40% of current pernnial yield) will effect key water sources and further deplete the carrying capacity. In the operation phsase, 0.5% of pronghorn range and 1.8% of the key habitat will be eliminated in Pine Valley.

2. What is the effect of the disturbance on the viability of the resource?

1	2	3	4	5
no change in viability		some decrease in viability		major decrease in viability

Due to reduced carrying capacity (see above), restricted movement during construction, and the possibility of impact to important water sources, pronghorn numbers will decrease.

3. What is the effect of the disturbance on the quality of the resource?

1	2	3	4	5
no loss in quality		some loss in quality		major loss in quality

Following the reasoning in Questions 1 and 2, decreased viability and population levels will reduce pronghorn population quality.

4. To what extent will the effect be masked by normal variation expressed by the resource?

1	2	3	4	5
completely masked		some masking		no masking

Natural populations exhibit some normal variation. Long-term monitoring of population parameters should disclose significant effects; however, effects determined by short-term population counts maybe masked to a degree by normal variation.

5. To what extent will the effect on the resource be masked by normal resource variability when the influence of potential future projects other than M-X are imposed.

1	2	3	4	5
completely masked		some masking		no masking

Effects should be more or less equivalent to those discussed in the previous question. The Pine Grove molybdenum mine has influenced pronghorn to some extent.

6. How rapidly will the resource recover from the disturbance effect if the effect is temporary?

1	2	3	4	5
rapid recovery		slow recovery		no recovery

Although pronghorn recruitment rates in the Great Basin are generally depressed, they exhibit some behavioral adaptability, and without substantial disturbance, they should recover to a large extent in 2 to 15 years.

7. How rapidly will the resource recover from the disturbance effect if the effect is permanent?

1	2	3	4	5
rapid recovery		slow recovery		no recovery

If harrassment, habitat loss and decreased water sources persist, pronghorn will continue to be excluded form key habitat and may not recover at all.

8. To what extent will the resource recover from the disturbance effect in a reasonable time period?

1	2	3	4	5
full recovery		moderate recovery		no recovery

As per question # 6, if the major disturbance is temporary pronghorn have a good cahnce to recover in a reasonable time period.

9. To what extent will the resource recover from the effect when this effect is combined with other disturbances expected from M-X (cumulative effects)?

1	2	3	4	5
full recovery		moderate recovery		no recovery

Other effects such as a large influx of people due to an OB in the vicinity will certainly compound the effect to pronghorn and leesen recovery potential and recovery rates discussed in Questions 6-8.

10. How geographically widespread is the effect of the disturbance on the resource?

1	2	3	4	5
localized effect				widespread effect

Construction activities will affect pronghorn within 1 mile of construction sites, and may affect movements throughout parts of the valley. Operation activities will presumably only affect pronghorn in areas of exclusion; it is probable that pronghorn will cross roads to move within their range if traffic levels are as low as predicted (4-5 million M-X travel miles throughout the entire DTN annually).

11. To what extent will the effect change the aesthetic value of the resource?

1	2	3	4	5
no change in aesthetic value		moderate decrease in aesthetic value		major decrease in aesthetic value

If pronghorn numbers and visibility are decreased significantly, the aesthetic and scientific value of the resource will decrease correspondingly.

12. What is the scientific or intrinsic value of the resource?

1	2	3	4	5
low scientific or intrinsic value		moderate scientific or intrinsic value		high scientific or intrinsic value

Pronghorn are the only extant ungulate species endemic to North America. They have high scientific value because of this unique status and the evolutionary implications of this and other aspects of their morphology. Because they are a readily observable species they have a high value for behavioral studies, foraging ecology studies and many other research studies. Their intrinsic aesthetic appeal is very high, and they have value as a huntable game animal.

Issue 1
Competition for Resources

1. How does a change in the effect affect the viability of the resource?

1	2	3	4	5

See Question 2 on 1st page of questionnaire.

2. To what extent will the resource continue to be usable with the same level of quality and capacity for renewal that it previously had

1	2	3	4	5
no reduction in usefulness to humans		partial reduction in usefulness to humans		major reduction in usefulness to humans

See Questions 2 and 3 in the preceeding section.

3. What is the extent to which the resource will become limited to the point of threatening the carrying capacity of the area or developmental trends which have already been in motion for some historic period of time.

1	2	3	4	5

1	2	3	4	5

Issue 2
Constraint on Future
Development Opportunities

1. Is the change in the effect observable relative to the potential variations in the baseline or trust or other competitors for these development opportunities.

1	2	3	4	5

See Question #5 in the first section of the questionaire.

2. To what extent does the change in the effect produce a developmental constraint that is observable?

1	2	3	4	5

N/A

3. To what extent does the change in the effect variable degrade the environmental resource which is or would be needed by other competitors?

1	2	3	4	5
no constraint on other future uses		moderate constraint on other future uses		major constraint on other future uses

N/A

4. To what extent does the change in the environmental variable when combined with competing opportunities cause a considerable stress on some portion of the environment which would not occur if the competition were not there or if constraints were imposed on the developmental directions for the various interested competitors.

1	2	3	4	5

N/A

5. To what extent is the change in the effect variable a significant modifier of other developmental actions which are planned to take place. For example, will it compete for the same space, will it cause that space to be unusable, will it require stress on limited resources, changes in transportation of goods, etc.?

1	2	3	4	5

N/A

1	2	3	4	5

Issue 3
Stress on Growing Communities

1. Is the change in the effect variable large or the same value as established standards for this particular effect?

1	2	3	4	5

N/A

2. Is there a reasonable opportunity for recovery from changes in this effect in a reasonable period of time?

1	2	3	4	5

N/A

3. Will the quality of the area necessarily have to be changed in order to accommodate the changes in these effects?

1	2	3	4	5

N/A

4. Will the change in these effects levels produce a permanent change in some sector of the environmental and if so will that change be in total contrast with other induced changes already in process for the future development of the area or will these permanent changes be in concert with other expected changes?

1	2	3	4	5

N/A

5. Will the change in the effect level be significant within the context of the uncertainties of the growth pattern of the impacted regions? That is, if one assumes a 10 percent potential fluctuation in either the compositional structure of the demographics or in the absolute value of the population growth will the changes due to M-X be significantly larger or approximately the same amount of much smaller than this 10 percent absolute change?

1	2	3	4	5

N/A

6. Will growth trends in the area in terms of sectoral composition, population density, urban-rural transitions, and other uses of the land be modified significantly by M-X or will M-X's changes fit within the predicted trends for these areas?

1	2	3	4	5

N/A

7. Will planning for these areas require significant funding specifically for the properties and requirements of M-X or can they be included in umbrella types of funding which would include the future plans of the area and those requirements of M-X which add stress to the growing communities?

1	2	3	4	5

N/A

8. Will M-X require significant additional short-range planning or planning significantly accelerated relative to the planning required for the future development of the area?

1	2	3	4	5

N/A

9. To what extent will funding be required to mitigate the effect on the resource?

1	2	3	4	5
no funding required to mitigate		moderate funding required to mitigate		major funding required to mitigate

Mitigation such as developing artificial water source to replaced damaged natural ones would not be very costly.

10. To what extent will the effect on the resource have significant economic or social consequences on communities within the study area?

1	2	3	4	5
no significant economic or social consequences				major significant economic or social consequences

No significant economic consequences are anticipated. Reduced pronghorn populations will affect hunting opportunities for a sizeable subculture of the Great Basin. Many hunter may regard this as a signficant decrease in the quality of life in their vicinity.

Issue 4
Preservation of Biophysical and
Cultural Resources

1. What is the legal status of the resources changed from?

1	2	3	4	5
no legal status	state protected (game & nongame)	state protected rare or endangered	proposed federally protected	federally protected species (threatened & endangered)

Pronghorn are a state managed big game species.

2. Will a change in the effect potentially indirectly affect those resources which are legally protected?

1	2	3	4	5
minimal likelihood of affecting a legally protected resource		moderate likelihood of affecting a legally protected resource		high likelihood of affecting a legally protected resource

Pronghorn will very likely be affected by habitat disturance as discussed in the first 12 questions. Decreasing pronghorn populations will not affect any other legally protected resource.

3. Will a change in the effect require either behavioral modifications or changes in life patterns in order to preserve the specific cultural resources?

1 2 3 4 5

N/A

4. Will a change in the effect lead to a permanent degradation of some portion of the ecosystem which the cultural resources depends on?

1 2 3 4 5

N/A

5. Will a change in the environment effect lead to a degradation of some portion of the ecosystem which contains resources needed for the preservation of a cultural or biological resource?

1	2	3	4	5

6. Will a change in the effect level cause a degradation in the quality or aesthetics of the particular resource that is to be preserved, and will this be a major or a minor change in the aesthetic or quality feature?

1	2	3	4	5
no degradation of quality or aesthetics		moderate degradation of quality or aesthetics		major degradation of quality or aesthetics

If pronghorn numbers suffer significantly, the aesthetic value and scientific value of the resource will decrease correspondingly.

General Consequences

1. Are the consequences such that the portion of the ecosystem or society will not recover at all?

1	2	3	4	5
no likelihood of irreparable damage to ecosystem		moderate likelihood		certain irreparable damage to ecosystem

Although consequences may be great, HDR research and other studies (Kitchen 1974) have shown some degree of pronghorn adaptability to disturbance. This ability may allow pronghorn to avoid extirpation from the ecosystem. If pronghorn do disappear from critical areas, renitroduction offer M-X decommission appears possible, though costly.

2. Are the consequences such that the impact maybe large, but the recovery processes will overcome the damage in a reasonable period of time?

1	2	3	4	5
full recovery		partial recovery		no recovery

See above discussion. Partial recovery may take 10 years or longer, but it is likely that pronghorn will substantially recover in 50 years.

3. Are the deleterious effects measurable?

1	2	3	4	5
not measureable		measureable with difficulty		readily measurable

Pronghorn censuses are regularly conducted by stable management agencies and deleterious effects will be observable and measurable by census.

4. Will a change in the effect change the functional relationships existing within the ecosystem and will this cause a change in either the carrying capacity or other characteristics of viability associated with the system?

1	2	3	4	5
no change in in functional relationships		moderate change in relationships		major change in relationships

Pronghorn food habits have been shown to overlap those of certain other ungulates in parts of the Great Basin (Beale & Smith 1970, Tueller 1979, Papez 1977), and pronghorn fawns are preyed upon by coyotes, bobcats and golden eagles in year when other prey species are not abundant (Beale and Smith 1973, Beale and Holmgren 1978). However, pronghorn population changes will probably not affect these species to any large extent.

5. Do these deleterious effects or consequences result in degradation of other measurable environmental variables?

1	2	3	4	5

No. See discussion of preceeding question.

6. Although the environmental effect itself may not be significant within the framework of the first five criteria, will it when measured in conjunction with certain other critical environmental variables produce changes that are observable within the framework of the criteria of the five standards?

1	2	3	4	5

It is almost certain that habitat loss will combined with the effects of human harrassment and illegal harves to produce signifcant, observable changes in pronghorn populations.

Consequences Which Are Specific to an
Individual Environmental Variable

Bighorn Sheep: Effects of People: worst case using vicinity of Coyote Spring OB

1. To what extent will the effect alter the carrying capacity of the environment for the resource?

1	2	3	4	5
no change in carrying capacity		some reduction in carrying capacity		major reduction in carrying capacity

Recreation activities at water sites may reduce carrying capacity to some extent in Delamar Range, Meadow Valley Mountains & Arrow Canyon Range where access is good. Little effect expected in Sheep Range because access is very limited.

2. What is the effect of the disturbance on the viability of the resource?

1	2	3	4	5
no change in viability		some decrease in viability		major decrease in viability

Decrease in viability depends upon level of population decrease and amount of habitat lost. If key habitat areas such as water source are excluded from use, populations within that mountain range may decline even to the point of extirpation.

3. What is the effect of the disturbance on the quality of the resource?

1	2	3	4	5
no loss in quality		some loss in quality		major loss in quality

Quality is not affected only quantity.

4. To what extent will the effect be masked by normal variation expressed by the resource?

1	2	3	4	5
completely masked		some masking		no masking

Populations show normal annual fluctuation that result from climatic and biotic (e.g., predators) factors. Loss of some sheep would be partially masked by this normal variation .

5. To what extent will the effect on the resource be masked by normal resource variability when the influence of potential future projects other than M-X are imposed.

1	2	3	4	5
completely masked		some masking		no masking

Same as 4. The only other potential project in this area is the H. Allen power plant and and the affects of this are expected to interact with the effects of M-X for only a short time and at a low level.

6. How rapidly will the resource recover from the disturbance effect if the effect is temporary?

1	2	3	4	5
rapid recovery		slow recovery		no recovery

Recovery of populations to predisturbance levels should occur in approximately 5 years if sheep are not completely extirpated from portions of their range.

7. How rapidly will the resource recover from the disturbance effect if the effect is permanent?

1	2	3	4	5
rapid recovery		slow recovery		no recovery

Carrying capacity is very limited, primarily because of restricted water sources, and loss of any wter sources could permanently reduce population levels.

8. To what extent will the resource recover from the disturbance effect in a reasonable time period?

1	2	3	4	5
full recovery		moderate recovery		no recovery

Recovery should be complete if disturbance is temporary. However, an OB would be used for approximately 20 years, so the effect could be long-term with only moderate recovery.

9. To what extent will the resource recover from the effect when this effect is combined with other disturbances expected from M-X (cumulative effects)?

1	2	3	4	5
full recovery		moderate recovery		no recovery

same as 8

10. How geographically widespread is the effect of the disturbance on the resource?

1	2	3	4	5
localized effect				widespread effect

Effects are expected to occur within 35 mi of the OB since road access in the mountains is poor and people are not likely to drive for many hours on poor roads to disturb bighorns when other more attractive recreation areas (Lake Mead, Valley of Fire, Las Vegas) are nearby.

11. To what extent will the effect change the aesthetic value of the resource?

1	2	3	4	5
no change in aesthetic value		moderate decrease in aesthetic value		major decrease in aesthetic value

Loss of bighorns will reduce opportunities for observation.

12. What is the scientific or intrinsic value of the resource?

1	2	3	4	5
low scientific or intrinsic value		moderate scientific or intrinsic value		high scientific or intrinsic value

Prized game animal and has high aesthetic appeal for observation and photography. Also has scientific value and numerous research projects are conducted by researchers.

Issue 1
Competition for Resources

1. How does a change in the effect affect the viability of the resource?

1	2	3	4	5

Same as #2 on Page 1.

2. To what extent will the resource continue to be usable with the same level of quality and capacity for renewal that it previously had

1	2	3	4	5
no reduction in usefulness to humans		partial reduction in usefulness to humans		major reduction in usefulness to humans

Any loss of animals from poaching or habitat loss will reduce opportunities for hunting and observation.

3. What is the extent to which the resource will become limited to the point of threatening the carrying capacity of the area or developmental trends which have already been in motion for some historic period of time.

1 2 3 4 5

same as #1 on Page 1.

1 2 3 4 5

Issue 2
Constraint on Future
Development Opportunities

1. Is the change in the effect observable relative to the potential variations in the baseline or trust or other competitors for these development opportunities.

1	2	3	4	5

Same as 4 and 5 under consequences specific to individual variables.

2. To what extent does the change in the effect produce a developmental constraint that is observable?

1	2	3	4	5

May constrain recreational uses of bighorns if populations decine as a result of M-X.

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3. To what extent does the change in the effect variable degrade the environmental resource which is or would be needed by other competitors?

1	2	3	4	5
no constraint on other future uses		moderate constraint on other future uses		major constraint on other future uses

N/A

4. To what extent does the change in the environmental variable when combined with competing opportunities cause a considerable stress on some portion of the environment which would not occur if the competition were not there or if constraints were imposed on the developmental directions for the various interested competitors.

1	2	3	4	5

N/A

5. To what extent is the change in the effect variable a significant modifier of other developmental actions which are planned to take place. For example, will it compete for the same space, will it cause that space to be unusable, will it require stress on limited resources, changes in transportation of goods, etc.?

1	2	3	4	5

N/A

1	2	3	4	5

Issue 3
Stress on Growing Communities

1. Is the change in the effect variable large or the same value as established standards for this particular effect?

1	2	3	4	5

N/A

2. Is there a reasonable opportunity for recovery from changes in this effect in a reasonable period of time?

1	2	3	4	5

Same as #8 under effects specific to individual variables.

3. Will the quality of the area necessarily have to be changed in order to accommodate the changes in these effects?

1	2	3	4	5

N/A

4. Will the change in these effects levels produce a permanent change in some sector of the environmental and if so will that change be in total contrast with other induced changes already in process for the future development of the area or will these permanent changes be in concert with other expected changes?

1	2	3	4	5

N/A

5. Will the change in the effect level be significant within the context of the uncertainties of the growth pattern of the impacted regions? That is, if one assumes a 10 percent potential fluctuation in either the compositional structure of the demographics or in the absolute value of the population growth will the changes due to M-X be significantly larger or approximately the same amount of much smaller than this 10 percent absolute change?

1 2 3 4 5

Significant increase in human population resulting from M-X.

6. Will growth trends in the area in terms of sectoral composition, population density, urban-rural transitions, and other uses of the land be modified significantly by M-X or will M-X's changes fit within the predicted trends for these areas?

1 2 3 4 5

Significant modification - development of a new area.

7. Will planning for these areas require significant funding specifically for the properties and requirements of M-X or can they be included in umbrella types of funding which would include the future plans of the area and those requirements of M-X which add stress to the growing communities?

1	2	3	4	5

N/A

8. Will M-X require significant additional short-range planning or planning significantly accelerated relative to the planning required for the future development of the area?

1	2	3	4	5

N/A

9. To what extent will funding be required to mitigate the effect on the resource?

1	2	3	4	5
no funding required to mitigate		moderate funding required to mitigate		major funding required to mitigate

May require some funding for public education about bighorns, for signs and possible fences or gates to limit entry into important bighorn use areas, and for increased numbers of game wardens to control poaching.

10. To what extent will the effect on the resource have significant economic or social consequences on communities within the study area?

1	2	3	4	5
no significant economic or social consequences				major significant economic or social consequences

N/A

Issue 4
Preservation of Biophysical and
Cultural Resources

1. What is the legal status of the resources changed from?

1	2	3	4	5
no legal status	state protected (game & nongame)	state protected rare or endangered	proposed federally protected	federally protected species (threatened & endangered)

Big game species with limited hunting allowed in Nevada and Utah.

2. Will a change in the effect potentially indirectly affect those resources which are legally protected?

1	2	3	4	5
minimal likelihood of affecting a legally protected resource		moderate likelihood of affecting a legally protected resource		high likelihood of affecting a legally protected resource

Bighorn sheep are not a food source, competitor, or predator on any protected species; therefore, no effect is expected.

3. Will a change in the effect require either behavioral modifications or changes in life patterns in order to preserve the specific cultural resources?

1	2	3	4	5

N/A

4. Will a change in the effect lead to a permanent degradation of some portion of the ecosystem which the cultural resources depends on?

1	2	3	4	5

N/A

5. Will a change in the environment effect lead to a degradation of some portion of the ecosystem which contains resources needed for the preservation of a cultural or biological resource?

1	2	3	4	5

N/A

6. Will a change in the effect level cause a degradation in the quality or aesthetics of the particular resource that is to be preserved, and will this be a major or a minor change in the aesthetic or quality feature?

1	2	3	4	5
no degradation of quality or aesthetics		moderate degradation of quality or aesthetics		major degradation of quality or aesthetics

Decrease in numbers of bighorns would reduce opportunities for observation.

1. Are the consequences such that the portion of the ecosystem or society will not recover at all?

1	2	3	4	5
no likelihood of irreparable damage to ecosystem		moderate likelihood		certain irreparable damage to ecosystem

Loss of bighorns could be recovered by natural reproduction or through transplants once disturbance is terminated.

2. Are the consequences such that the impact maybe large, but the recovery processes will overcome the damage in a reasonable period of time?

1	2	3	4	5
full recovery		partial recovery		no recovery

Recovery will depend upon the type and duration of the disturbance. Recovery should be very high if disturbance is only temporary.

3. Are the deleterious effects measurable?

1	2	3	4	5
not measureable		measureable with difficulty		readily measurable

Counting of bighorns is fairly easy, but expensive (requires the use of aircraft), and population estimates can be made fairly accurately.

4. Will a change in the effect change the functional relationships existing within the ecosystem and will this cause a change in either the carrying capacity or other characteristics of viability associated with the system?

1	2	3	4	5
no change in in functional relationships		moderate change in relationships		major change in relationships

Bighorns are herbivores that are not an important food item for any carnivores nor competitor of any other major species.

5. Do these deleterious effects or consequences result in degradation of other measurable environmental variables?

1 2 3 4 5

N/A

6. Although the environmental effect itself may not be significant within the framework of the first five criteria, will it when measured in conjunction with certain other critical environmental variables produce changes that are observable within the framework of the criteria of the five standards?

1 2 3 4 5

N/A

Consequences Which Are Specific to an
Individual Environmental Variable

Resource: Sage Grouse
Disturbance: Increased Human Population
Kobeh Valley, Nevada

1. To what extent will the effect alter the carrying capacity of the environment for the resource?

1	2	3	4	5
no change in carrying capacity		some reduction in carrying capacity		major reduction in carrying capacity

The peak construction period in Kobeh Valley would be in 1988, where 1752 people are expected to be present in a construction camp. Sage grouse are sensitive to moderate heavy human activities, such as those associated with construction work and recreation (e.g., hunting, ORV use, camping, etc.). There is evidence to show that human activity can have an effect radius of up to 1 mile. Behavioral avoidance of habitat, and hence effective habitat loss would result in a loss of carrying capacity.

2. What is the effect of the disturbance on the viability of the resource?

1	2	3	4	5
no change in viability		some decrease in viability		major decrease in viability

The peak construction period in Kobeh Valley would be in 1988 with the expectation of 1752 people present in the construction camp. Sage grouse are sensitive to moderately heavy human activities such as those associated with construction work and recreation (e.g. hunting, ORV use, camping, etc.). There is evidence that human activity can have a radius of effect of up to one mile. Behavioral avoidance of habitat, and hence effective habitat loss would result in a loss of carrying capacity.

3. What is the effect of the disturbance on the quality of the resource?

1	2	3	4	5
no loss in quality		some loss in quality		major loss in quality

Loss of key habitat because of behavioral avoidance of human activity by sage grouse would either cause a reduction or loss of sage grouse populations by forcing them into marginal habitat (if it is available), or else put stress on the birds which could reduce reproductive success. In either case quality of sage grouse populations would be reduced.

4. To what extent will the effect be masked by normal variation expressed by the resource?

1	2	3	4	5
completely masked		some masking		no masking

Sage grouse abundance is highly dependent upon eliminate conditions (e.g., precipitation & temperature) which fluctuate from year to year. Therefore, some masking of the effects of human population would be expected to occur. The effect of direct loss to key habitat due to construction is expected to greatly outweigh the human effects, and may mask them somewhat.

5. To what extent will the effect on the resource be masked by normal resource variability when the influence of potential future projects other than M-X are imposed.

1	2	3	4	5
completely masked		some masking		no masking

No other projects besides M-X are planned for Kobeh Valley. See question 4 above.

6. How rapidly will the resource recover from the disturbance effect if the effect is temporary?

1	2	3	4	5
rapid recovery		slow recovery		no recovery

Sage grouse are fairly resilient if their habitats are not severely damaged. If they leave habitat during the construction phase because of behavioral avoidance, they should return after the completion of construction, though initially at a lower level. The overall abundance of grouse in Kobeh Valley is not expected to recover above 70 percent of current baseline because of the large loss of key habitat (45 percent of leks and 20 percent of brood use areas) to construction

7. How rapidly will the resource recover from the disturbance effect if the effect is permanent?

1	2	3	4	5
rapid recovery		slow recovery		no recovery

The most intense effects from human population will be temporary. Once the construction camp is removed little recreation activity would be expected because Kobeh Valley is a long distance from any major town, or any proposed OB site. Sage grouse should recover under low intensity permanent human activity.

8. To what extent will the resource recover from the disturbance effect in a reasonable time period?

1	2	3	4	5
full recovery		moderate recovery		no recovery

Moderate recovery of sage grouse would be expected from human disturbances caused by construction and a construction camp, since most of these effects would be temporary (1 - 2 years). Sage grouse will re-establish in habitat previously abandoned due to behavioral avoidance of humans. However, recovery will be greatly restrained (up to 70% of current abundance) because of permanent loss of key habitat to construction.

9. To what extent will the resource recover from the effect when this effect is combined with other disturbances expected from M-X (cumulative effects)?

1	2	3	4	5
full recovery		moderate recovery		no recovery

Increased human population when combined with direct habitat loss and other projected effects from M-X will allow for only a partial recovery of sage grouse populations in the Great Basin. Sage grouse appear to be modertely adaptable to human presence if they are not harassed; and if the disturbances are temporary recovery can occur. Sage grouse, however, will seldom recover significantly if a major portion of their key habitat is removed.

10. How geographically widespread is the effect of the disturbance on the resource?

1	2	3	4	5
localized effect				widespread effect

The effect of human disturbance on sage grouse has been projected to be a radius of approximately one mile - line of sight (Molini, Dept. of Wildlife, Nevada, pers. comm., 1980).

11. To what extent will the effect change the aesthetic value of the resource?

1	2	3	4	5
no change in aesthetic value		moderate decrease in aesthetic value		major decrease in aesthetic value

A loss or reduction in sage grouse populations would mean less sage grouse available to be used and appreciated by non-consumptive recreationists. With less grouse available those remaining will also be harder to find and observe. Perhaps a 10% reduction during the first two years of construction and operation could be accounted for by human activity.

12. What is the scientific or intrinsic value of the resource?

1	2	3	4	5
low scientific or intrinsic value		moderate scientific or intrinsic value		high scientific or intrinsic value

The scientific value of sage grouse is difficult to quantify. The species has been studied intensively in several locations in the Great Basin. The sage grouse is a rare species in the region in that it is highly dependant upon sagebrush for both food and cover. As such it is sensitive to disturbances in the sagebrush community, and may be a valuable indicator species for assessing environmental degredation.

Issue 1
Competition for Resources

1. How does a change in the effect affect the viability of the resource?

1 2 3 4 5

2. To what extent will the resource continue to be usable with the same level of quality and capacity for renewal that it previously had

1 2 3 4 5

no reduction in usefulness to humans	partial reduction in usefulness to humans	major reduction in usefulness to humans

Abandonment of key habitat will result in loss or reduction in sage grouse population (perhaps 10 percent in Kobeh Valley). This population change would result in fewer grouse available to hunters and non-consumtive recreationists. Since greater distances might have to be travelled to find abundant sage grouse populations, there could be a real cost to people both in tiem and money. Also, with a drop in populations, state wildlife agencies are likely to enact more severe restrictions on hunting.

3. What is the extent to which the resource will become limited to the point of threatening the carrying capacity of the area or developmental trends which have already been in motion for some historic period of time.

1	2	3	4	5

1	2	3	4	5

Issue 2
Constraint on Future
Development Opportunities

1. Is the change in the effect observable relative to the potential variations in the baseline or trust or other competitors for these development opportunities.

1 2 3 4 5

2. To what extent does the change in the effect produce a developmental constraint that is observable?

1 2 3 4 5

3. To what extent does the change in the effect variable degrade the environmental resource which is or would be needed by other competitors?

1	2	3	4	5
no constraint on other future uses		moderate constraint on other future uses		major constraint on other future uses

Loss of sage grouse populations due to incresed human population means less grouse are available for use by both consumptive and nonconsumptive recreationists in the study area, both for current and future projects. See Issue 1 Question 2.

4. To what extent does the change in the environmental variable when combined with competing opportunities cause a considerable stress on some portion of the environment which would not occur if the competition were not there or if constraints were imposed on the developmental directions for the various interested competitors.

1	2	3	4	5

5. To what extent is the change in the effect variable a significant modifier of other developmental actions which are planned to take place. For example, will it compete for the same space, will it cause that space to be unusable, will it require stress on limited resources, changes in transportation of goods, etc.?

1	2	3	4	5

1	2	3	4	5

Issue 3
Stress on Growing Communities

1. Is the change in the effect variable large or the same value as established standards for this particular effect?

1	2	3	4	5

2. Is there a reasonable opportunity for recovery from changes in this effect in a reasonable period of time?

1	2	3	4	5

3. Will the quality of the area necessarily have to be changed in order to accommodate the changes in these effects?

1	2	3	4	5

4. Will the change in these effects levels produce a permanent change in some sector of the environmental and if so will that change be in total contrast with other induced changes already in process for the future development of the area or will these permanent changes be in concert with other expected changes?

1	2	3	4	5

5. Will the change in the effect level be significant within the context of the uncertainties of the growth pattern of the impacted regions? That is, if one assumes a 10 percent potential fluctuation in either the compositional structure of the demographics or in the absolute value of the population growth will the changes due to M-X be significantly larger or approximately the same amount of much smaller than this 10 percent absolute change?

1	2	3	4	5

6. Will growth trends in the area in terms of sectoral composition, population density, urban-rural transitions, and other uses of the land be modified significantly by M-X or will M-X's changes fit within the predicted trends for these areas?

1	2	3	4	5

7. Will planning for these areas require significant funding specifically for the properties and requirements of M-X or can they be included in umbrella types of funding which would include the future plans of the area and those requirements of M-X which add stress to the growing communities?

1	2	3	4	5

8. Will M-X require significant additional short-range planning or planning significantly accelerated relative to the planning required for the future development of the area?

1	2	3	4	5

9. To what extent will funding be required to mitigate the effect on the resource?

1	2	3	4	5
no funding required to mitigate		moderate funding required to mitigate		major funding required to mitigate

Mitigation would involve avoidance of all sage grouse key habitat possible during the design and siting phase of the project. More intense management of this species by state wildlife agencies to increase grouse productivity and develop new high quality habitats would also be necessary. This increased management activity would require development of new funds at the state or local level. Ban on firearms for construction crews during M-X construction phase, plus more stringent enforcement by state agencies of game laws against poaching would be required.

10. To what extent will the effect on the resource have significant economic or social consequences on communities within the study area?

1	2	3	4	5
no significant economic or social consequences				major significant economic or social consequences

The only significant consequences will involve those who hunt sage grouse or enjoy this species as an aesthetic resource. This is expected to be a relatively small consequence in terms of effecting the community.

Issue 4
Preservation of Biophysical and
Cultural Resources

1. What is the legal status of the resources

1	2	3	4	5
no legal status	state protected (game & nongame)	state protected rare or endangered	proposed federally protected	federally protected species (threatened & endangered)

The sage grouse is listed by state agencies in the Great Basin as an upland game species. As such, it is protected and regulated by state game laws - such as hunting season and bad limits.

2. Will a change in the effect potentially indirectly affect those resources which are legally protected?

1	2	3	4	5
minimal likelihood of affecting a legally protected resource		moderate likelihood of affecting a legally protected resource		high likelihood of affecting a legally protected resource

Sage grouse are preyed upon by several raptor species. Raptors may not be killed in the Great Basin, as they are protected by state wildlife laws. A loss or reduction of sage grouse populations due to loss of key habitat, due to avoidance of human activity, would reduce the prey base for some raptures, although the reduction would be minor because no raptor species preys primarily on sage grouse.

3. Will a change in the effect require either behavioral modifications or changes in life patterns in order to preserve the specific cultural resources?

1 2 3 4 5

4. Will a change in the effect lead to a permanent degradation of some portion of the ecosystem which the cultural resources depends on?

1 2 3 4 5

5. Will a change in the environment effect lead to a degradation of some portion of the ecosystem which contains resources needed for the preservation of a cultural or biological resource?

1	2	3	4	5

6. Will a change in the effect level cause a degradation in the quality or aesthetics of the particular resource that is to be preserved, and will this be a major or a minor change in the aesthetic or quality feature?

1	2	3	4	5
no degradation of quality or aesthetics		moderate degradation of quality or aesthetics		major degradation of quality or aesthetics

See Questions 3 and 11 under Consequences Which Are Specific to an Individual Environmental Variable.

General Consequences

1. Are the consequences such that the portion of the ecosystem or society will not recover at all?

1	2	3	4	5
no likelihood of irreparable damage to ecosystem		moderate likelihood		certain irreparable damage to ecosystem

Sage grouse have demonstrated an adaptability to the presense of humans, but heavy recreation in key habitat areas, or within one mile of these habitats could prevent the species from recovering fully. Intense management of sage grouse by state wildlife agencies could greatly improve their chances for a full recovery. Even at the peak of construction activity, with a human population of 1752 in Kobeh Valley, there should be minimal irreparable damage to the ecosystem.

2. Are the consequences such that the impact maybe large, but the recovery processes will overcome the damage in a reasonable period of time?

1	2	3	4	5
full recovery		partial recovery		no recovery

See Question #1 above. Sage grouse are sensitive to disturbance but can be managed to bring about some recovery. Recovery would be most rapid in areas where key habitat remains intact and relatively undisturbed, especially during the reproductive season.

3. Are the deleterious effects measurable?

1	2	3	4	5
not measureable		measureable with difficulty		readily measurable

Abandonment of key habitat due to human disturbance during construction should be observable in most cases. The effects of recreationists may be more subtle and require more detailed investigations. The more subtle the human effects the more likely the effects will be masked by normal sage grouse population fluctuations.

4. Will a change in the effect change the functional relationships existing within the ecosystem and will this cause a change in either the carrying capacity or other characteristics of viability associated with the system?

1	2	3	4	5
no change in in functional relationships		moderate change in relationships		major change in relationships

Although certain raptors prey upon sage grouse no predators are dependent upon this species. Also, sage grouse use of vegetation and insects for food in minor compared to other herbivores -because of relatively low grouse populations in the Great Basin. Although functional relationships in the ecosystem will be changed (by loss of sage grouse due to habitat loss) the system is interactive and complex enough so that little or no measurable effect on ecosystem function is predicted.

5. Do these deleterious effects or consequences result in degradation of other measurable environmental variables?

1	2	3	4	5

6. Although the environmental effect itself may not be significant within the framework of the first five criteria, will it when measured in conjunction with certain other critical environmental variables produce changes that are observable within the framework of the criteria of the five standards?

1	2	3	4	5

Consequences Which Are Specific to an
Individual Environmental Variable

Resource: Sage Grouse   Disturbance: Habitat Loss

1. To what extent will the effect alter the carrying capacity of the environment for the resource?

1	2	3	4	5
no change in carrying capacity		some reduction in carrying capacity		major reduction in carrying capacity

Loss of key habitat in a valley could result in carrying capacity dropping to zero - if all key habitat is removed. In valleys where only a portion of key habitat is lost carrying capacity will be significantly lowered but sage grouse may still use the valley - only less productive habitat. This would result in a drop in sage grouse population eventually. In valleys where no habitat is lost carrying capacity will not be altered.

2. What is the effect of the disturbance on the viability of the resource?

1	2	3	4	5
no change in viability		some decrease in viability		major decrease in viability

The viability of each sage grouse population will be different in each valley. In those valleys where loss of key habitat is severe those population will no longer be viable. In those where there is only partial loss of key habitat the threat of loss of viability is less. Loss of key habitat may stress the population to the point where it becmes highly susceptible to other negative effects - which would cause a loss of viability. In those valleys where there is no habitat loss no change in viability is expected.

3. What is the effect of the disturbance on the quality of the resource?

1	2	3	4	5
no loss in quality		some loss in quality		major loss in quality

The quality of the resource in the Great Basin will decline if key habitat is lost. Populations will be eliminated in some cases. In other cases grouse will be forced to utilize marginal habitat. This situation would reduce grouse productivity and vigor, which would eventually result in population declines and reduction in quality.

4. To what extent will the effect be masked by normal variation expressed by the resource?

1	2	3	4	5
completely masked		some masking		no masking

No significant amount of population fluctuation is expected which would mask the effects of key habitat loss. Loss of large amounts of key habitat is a major disturbance which would be readily observable. The effects of loss of small amounts of key habitat would be harder to separate from normal grouse population fluctuations.

5. To what extent will the effect on the resource be masked by normal resource variability when the influence of potential future projects other than M-X are imposed.

1	2	3	4	5
completely masked		some masking		no masking

Because loss of key habitat is localized it should be evident to which cause (i.e. M-X or other trusts) is responsible for loss of sage grouse. See Issue 4 - question 6 for more details.

6. How rapidly will the resource recover from the disturbance effect if the effect is temporary?

1	2	3	4	5
rapid recovery		slow recovery		no recovery

If loss of key habitat is only temporary (i.e. restoration and management) sage grouse should recover at a moderate rate. Key habitat is often traditionally used (i.e. leks) - so sage grouse wuld likely return once the disturbance is removed.

7. How rapidly will the resource recover from the disturbance effect if the effect is permanent?

1	2	3	4	5
rapid recovery		slow recovery		no recovery

Large scale permanent loss of key habitat will severely restrict the ability of this species to recover, in terms of population size and vigor. In smaller more localized disturbances some recovery may occur as grouse adapt to ulitizing marginal habitats.

8. To what extent will the resource recover from the disturbance effect in a reasonable time period?

1	2	3	4	5
full recovery		moderate recovery		no recovery

In a heavily impacted watershed such as Kobeh Valley, where 30 to 50% of the known key habitat would be removed, little recovery would be expected. The sage grouse life cycle is closely tied to lek - brood-use area complexes, and there is little or no movement of grouse between complexes in a valley. Therefore, those populations that lose their key habitat are highly likely to perish, and little or no recolinization would be expected from neighboring populations in the short-term. Populations may recover to 70% of baseline abundance.

9. To what extent will the resource recover from the effect when this effect is combined with other disturbances expected from M-X (cumulative effects)?

1	2	3	4	5
full recovery		moderate recovery		no recovery

Habitat loss when combined with increased human population and other projected effects from M-X will allow for only a partial recovery of sage grouse populations in the Great Basin. Sage grouse appear to be moderately adaptable to human presence if they are not harassed; and if the disturbances are temporary recovery can occur. Sage grouse, however, will seldom recover significantly if a major portion of their key habitat is removed.

10. How geographically widespread is the effect of the disturbance on the resource?

1	2	3	4	5
localized effect				widespread effect

Loss of key habitat will be relatively localized because this habitat consists normally of small dispersed areas, often associated with riparian or wet meadow areas, or traditional leks. Loss of key habitat may force grouse into less suitable habitat, where population will decline, or if enough habitat is lost this species will be exterpated from a valley.

11. To what extent will the effect change the aesthetic value of the resource?

1	2	3	4	5
no change in aesthetic value		moderate decrease in aesthetic value		major decrease in aesthetic value

A loss or reduction in sage grouse populations would mean less sage grouse available to be used and appreciated by non-consumptive recreationists. With less grouse available those remaining will also be harder to find and observe.

12. What is the scientific or intrinsic value of the resource?

1	2	3	4	5
low scientific or intrinsic value		moderate scientific or intrinsic value		high scientific or intrinsic value

The scientific value of grouse is difficult to quantify. These species has been studied intensively in several locations in the Great Basin. The sage grouse is a rare species in the region in that it is highly dependent for both food and cover upon sagebrush for survival. As such it is sensitive to disturbances in the sagebrush community, and may be a valuable indicator species for assessing environmental degradation.

Issue 1
Competition for Resources

1. How does a change in the effect affect the viability of the resource?

1 2 3 4 5

2. To what extent will the resource continue to be usable with the same level of quality and capacity for renewal that it previously had

1 2 3 4 5

no reduction in usefulness to humans	partial reduction in usefulness to humans	major reduction in usefulness to humans

Loss of key habitat will reduce or cause elimination of sage grouse populations in certain valleys. This population change would result in fewer grouse available to hunters. If grouse are eliminated from a valley a greater distance would have to be traveled by the recreationist in order to use this resource. Also, with a drop in sage grouse population state wildlife agencies are likely to enact more severe restrictions on hunting to preserve this species.

3. What is the extent to which the resource will become limited to the point of threatening the carrying capacity of the area or developmental trends which have already been in motion for some historic period of time.

1	2	3	4	5

1	2	3	4	5

Issue 2
Constraint on Future
Development Opportunities

1. Is the change in the effect observable relative to the potential variations in the baseline or trust or other competitors for these development opportunities.

1	2	3	4	5

2. To what extent does the change in the effect produce a developmental constraint that is observable?

1	2	3	4	5

3. To what extent does the change in the effect variable degrade the environmental resource which is or would be needed by other competitors?.

1	2	3	4	5
no constraint on other future uses		moderate constraint on other future uses		major constraint on other future uses

Loss of sage grouse populations due to key habitat loss meaens less grouse are available for use by both consumptive and nonconsumptive recreationists in the study area, both for current and future projects. See Issue 1 - question 2.

4. To what extent does the change in the environmental variable when combined with competing opportunities cause a considerable stress on some portion of the environment which would not occur if the competition were not there or if constraints were imposed on the developmental directions for the various interested competitors.

1	2	3	4	5

5. To what extent is the change in the effect variable a significant modifier of other developmental actions which are planned to take place. For example, will it compete for the same space, will it cause that space to be unusable, will it require stress on limited resources, changes in transportation of goods, etc.?

1	2	3	4	5

1	2	3	4	5

Issue 3
Stress on Growing Communities

1. Is the change in the effect variable large or the same value as established standards for this particular effect?

1	2	3	4	5

2. Is there a reasonable opportunity for recovery from changes in this effect in a reasonable period of time?

1	2	3	4	5

3. Will the quality of the area necessarily have to be changed in order to accommodate the changes in these effects?

1	2	3	4	5

4. Will the change in these effects levels produce a permanent change in some sector of the environmental and if so will that change be in total contrast with other induced changes already in process for the future development of the area or will these permanent changes be in concert with other expected changes?

1	2	3	4	5

5. Will the change in the effect level be significant within the context of the uncertainties of the growth pattern of the impacted regions? That is, if one assumes a 10 percent potential fluctuation in either the compositional structure of the demographics or in the absolute value of the population growth will the changes due to M-X be significantly larger or approximately the same amount of much smaller than this 10 percent absolute change?

1	2	3	4	5

6. Will growth trends in the area in terms of sectoral composition, population density, urban-rural transitions, and other uses of the land be modified significantly by M-X or will M-X's changes fit within the predicted trends for these areas?

1	2	3	4	5

7. Will planning for these areas require significant funding specifically for the properties and requirements of M-X or can they be included in umbrella types of funding which would include the future plans of the area and those requirements of M-X which add stress to the growing communities?

1	2	3	4	5

8. Will M-X require significant additional short-range planning or planning significantly accelerated relative to the planning required for the future development of the area?

1	2	3	4	5

9. To what extent will funding be required to mitigate the effect on the resource?

1	2	3	4	5
no funding required to mitigate		moderate funding required to mitigate		major funding required to mitigate

Mitigation would involve avoidance of all sage grouse key habitat possible during the design and siting phase of the project. More intense management of this species by state wildlife agencies to increase grouse productivity and develop new high quality habitats would also be necessary. This increased management activity would require development of new funds at the state or local level. Ban on firearms for construction crews during M-X construction phase, plus more stringent enforcement by state agencies of game laws against poaching would be required.

10. To what extent will the effect on the resource have significant economic or social consequences on communities within the study area?

1	2	3	4	5
no significant economic or social consequences				major significant economic or social consequences

The only significant consequences will involve those who hunt sage grouse or enjoy this species as an aesthetic resource. This is expected to be a relatively small consequence in terms of effecting the overall community.

Issue 4
Preservation of Biophysical and
Cultural Resources

1. What is the legal status of the resources

1	2	3	4	5
no legal status	state protected (game & nongame)	state protected rare or endangered	proposed federally protected	federally protected species (threatened & endangered)

The sage grouse is listed by state agencies in the Great Basin as an upland game species. As such, it is protected and regulated by state game laws - such as hunting season and bag limits.

2. Will a change in the effect potentially indirectly affect those resources which are legally protected?

1	2	3	4	5
minimal likelihood of affecting a legally protected resource		moderate likelihood of affecting a legally protected resource		high likelihood of affecting a legally protected resource

Sage grouse are preyed upon by several raptor or species. Raptors may not be killed in the Great Basin, as they are protected by state wildlife laws. A loss or reduction of sage grouse populations due to loss of key habitat would reduce the prey base for some raptures, although the reduction would be minor because no raptor species preys primarily on sage grouse.

3. Will a change in the effect require either behavioral modifications or changes in life patterns in order to preserve the specific cultural resources?

1	2	3	4	5

4. Will a change in the effect lead to a permanent degradation of some portion of the ecosystem which the cultural resources depends on?

1	2	3	4	5

5. Will a change in the environment effect lead to a degradation of some portion of the ecosystem which contains resources needed for the preservation of a cultural or biological resource?

1	2	3	4	5

6. Will a change in the effect level cause a degradation in the quality or aesthetics of the particular resource that is to be preserved, and will this be a major or a minor change in the aesthetic or quality feature?

1	2	3	4	5
no degradation of quality or aesthetics		moderate degradation of quality or aesthetics		major degradation of quality or aesthetics

See questions #3 and #11 under Consequences Which Are Specific to an Individual Environmental Variable.

General Consequences

1. Are the consequences such that the portion of the ecosystem or society will not recover at all?

1	2	3	4	5
no likelihood of irreparable damage to ecosystem		moderate likelihood		certain irreparable damage to ecosystem

Loss of key habitat such as strutting grounds (leks) and brood use areas will cause significant damage to sage grouse. However, sage grouse are not a major component of the Great Basin ecosystem, and therefore the probability of irreparable damage to that ecosystem is low.

2. Are the consequences such that the impact maybe large, but the recovery processes will overcome the damage in a reasonable period of time?

1	2	3	4	5
full recovery		partial recovery		no recovery

Some key habitat will be lost permanently and this will either eliminate sage grouse in the area or displace them into less productive habitat. In these disturbed areas little or no recovery would occur. In other areas key habitat may be only temporarily lost (e.g., areas that revegetate, etc.) and sage grouse may fully recover given time. Some sage grouse key habitat areas will not be affected at all by M-X deployment.

3. Are the deleterious effects measurable?

1	2	3	4	5
not measureable		measureable with difficulty		readily measurable

The effects of projected levels of habitat loss on sage grouse populations in the study area should be readily measurable provided that predisturbance baseline data (e.g. population levels; harvest per unit hunter effort are available for comparison. Loss of leks and brood-use areas, plus reduction or loss of population due to key habitat loss, can be accurately measured. Although more census work is needed in the deployment to ascertain the magnitude of key habitat loss, many leks and brood-use areas are already mapped.

4. Will a change in the effect change the functional relationships existing within the ecosystem and will this cause a change in either the carrying capacity or other characteristics of viability associated with the system?

1	2	3	4	5
no change in in functional relationships		moderate change in relationships		major change in relationships

Although certain raptors prey upon sage grouse no predators are dependent upon this species. Also, sage grouse use of vegetation and insects for food is minor compared to other herbivores - because of relativley low grouse populations in the Great Basin. Although functional relationships in the ecosystem will be changed (by loss of sage grouse due to habitat loss) the system is interactive and complex enough so that little or no measurable effect on ecosystem function is predicted.

3. Are the deleterious effects measurable?

1	2	3	4	5
not measureable		measureable with difficulty		readily measurable

The effects of projected levels of habitat loss on sage grouse populations in the study area should be readily measurable provided that predisturbance baseline data (e.g. population levels; harvest per unit hunter effort are available for comparison. Loss of leks and brood-use areas, plus reduction or loss of population due to key habitat loss, can be accurately measured. Although more census work is needed in the deployment to ascertain the magnitude of key habitat loss, many leks and brood-use areas are already mapped.

4. Will a change in the effect change the functional relationships existing within the ecosystem and will this cause a change in either the carrying capacity or other characteristics of viability associated with the system?

1	2	3	4	5
no change in in functional relationships		moderate change in relationships		major change in relationships

Although certain raptors prey upon sage grouse no predators are dependent upon this species. Also, sage grouse use of vegetation and insects for food is minor compared to other herbivores - because of relativley low grouse populations in the Great Basin. Although functional relationships in the ecosystem will be changed (by loss of sage grouse due to habitat loss) the system is interactive and complex enough so that little or no measurable effect on ecosystem function is predicted.

5. Do these deleterious effects or consequences result in degradation of other measurable environmental variables?

1 2 3 4 5

6. Although the environmental effect itself may not be significant within the framework of the first five criteria, will it when measured in conjunction with certain other critical environmental variables produce changes that are observable within the framework of the criteria of the five standards?

1 2 3 4 5

5. Do these deleterious effects or consequences result in degradation of other measurable environmental variables?

1	2	3	4	5

6. Although the environmental effect itself may not be significant within the framework of the first five criteria, will it when measured in conjunction with certain other critical environmental variables produce changes that are observable within the framework of the criteria of the five standards?

1	2	3	4	5

RESOURCE Sage Grouse ATTRIBUTE Population Size

GRADED CONSEQUENCES / PRIMARY DISTURBANCES	Habitat Loss	Increased Human Population					
Consequences Which are Specific to an Individual Environmental Variable							
To what extent will the effect alter the carrying capacity of the environment for the resource?	4	4					
2. What is the effect of the disturbance on the viability of the resource?	3	3					
3. What is the effect of the disturbance on the quality of the resource?	3	3					
4. To what extent will the effect be masked by normal variation expressed by the resource?	4	3					
5. To what extent will the effect on the resource variability when the influence of potential future projects other than M-X are imposed?	4	3					
6. How rapidly will the resource recover from the disturbance effect if the effect is temporary?	2	2					
7. How rapidly will the resource recover from the disturbance effect if the effect is permanent?	4	2					
8. To what extent will the resource recover from the disturbance effect in a reasonable time period?	4	3					
9. To what extent will the resource recover from the effect when this effect is combined with other disturbances expected from M-X (cumulative effects)?	3	3					
10. How geographically widespread is the effect of the disturbance or the resource?	1	2					
11. To what extent will the effect change the aesthetic value of the resource?	3	3					
12. What is the scientific or intrinsic value of the resource?	3	3					
Issue Areas							
Issue 1: Competition for Resources							
1. How does a change in the effect affect the viability of the resource?	NA	NA					
2. To what extent will the resource continue to be usable with the same level of quality and capacity for renewal that it previously had?	3	3					
3. What is the extent to which the resource will become limited to the point of threatening the carrying capacity of the area or developmental trends which have already been in motion for some historic period of time?	NA	NA					
Issue 2: Constraint on Future Development Opportunities							
1. Is the change in the effect observable relative to the potential variations in the baseline or trust or other competitors for these development opportunities?	NA	NA					
2. To what extent does the change in the effect produce a developmental constraint that is observable?	NA	NA					
3. To what extent does the change in the effect variable degrade the environmental resource which is or would be needed by other competitors?	3	2					

IMPACT SIGNIFICANCE ANALYSIS

RESOURCE_______________ ATTRIBUTE_______________

GRADED CONSEQUENCES \ PRIMARY DISTURBANCE							
Issue 2 (Cont.)							
4. To what extent does the change in the environmental variable when combined with competing opportunities cause a considerable stress on some portion of the environment which would not occur if the competition were not there or if constraints were imposed on the developmental directions for the various interested competitors?	NA	NA					
5. To what extent is the change in the effect variable a significant modifier of other developmental actions which are planned to take place. For example, will it compete for the same space, will it cause that space to be unusable, will it require stress on limited resources, changes in transportation of goods, etc.?	NA	NA					
Issue 3: Stress on Growing Communities							
1. Is the change in the effect variable large or the same value as established standards for this particular effect?	NA	NA					
2. Is there a reasonable opportunity for recovery from changes in this effect in a reasonable period of time?	NA	NA					
3. Will the quality of the area necessarily have to be changed in order to accommodate the changes in these effects?	NA	NA					
4. Will the change in these effects levels produce a permanent change in some sector of the environmental and if so will that change be in total contrast with other induced changes already in process for the future development of the area or will these permanent changes be in concert with other expected changes?	NA	NA					
Will the change in the effect level be significant within the context of the uncertainties of the growth pattern of the impacted regions? That is, if one assumes a 10 percent potential fluctuation in either the compositional structure of the demographics or in the absolute value of the population growth will the changes due to M-X be significantly larger or approximately the same amount or much smaller than this 10 percent absolute change?	NA	NA					
6. Will growth trends in the area in terms of sectoral composition, population density, urban-rural transitions, and other uses of the land be modified significantly by M-X or will M-X's changes fit within the predicted trends for these areas?	NA	NA					
7. Will planning for these areas require significant funding specifically for the properties and requirements of M-X or can they be included in umbrella types of funding which would include the future plans of the area and those requirements of M-X which add stress to the growing communities?	NA	NA					
8. Will M-X require significant additional short-range planning or planning significantly accelerated relative to the planning required for the future development of the area?	NA	NA					
9. To what extent will funding be required to mitigate the effect on the resource?	3	3					
10. To what extent will the effect on the resource have significant economic or social consequences on communities within the study area?	2	2					

3607

[illegible]

ATTRIBUTE ____________

PRIMARY DISTURBANCES / GRADED CONSEQUENCES							
Issue 4: Preservation of Biophysical and Cultural Resources							
1. What is the legal status of the resource changed from?	2	2					
2. Will a change in the effect potentially indirectly affect those resources which are legally protected?	3	3					
3. Will a change in the effect require either behavioral modifications or changes in life patterns in order to preserve the specific cultural resources?	NA	NA					
4. Will a change in the effect lead to a permanent degradation of some portion of the ecosystem which the cultural resources depends on?	NA	NA					
5. Will a change in the environment effect lead to a degradation of some portion of the ecosystem which contains resources needed for the preservation of a cultural or biological resource?	NA	NA					
6. Will a change in the effect level cause a degradation in the quality or aesthetics of the particular resource that is to be preserved, and will this be a major or a minor change in the aesthetic or quality feature?	3	3					
General Consequences							
1. Are the consequences such that the portion of the ecosystem or society will not recover at all?	2	2					
2. Are the consequences such that the impact may be large, but the recovery processes will overcome the damage in a reasonable period of time?	3	4					
3. Are the deleterious effects measurable?	5	4					
4. Will a change in the effect change the functional relationships existing within the ecosystem and will this cause a change in either the carrying capacity or other characteristics of viability associated with the system?	2	2					
5. Do these deleterious effects or consequences result in degradation of other measurable environmental variables?	NA	NA					
6. Although the environmental effect itself may not be significant within the framework of the first five criteria, will it when measured in conjunction with certain other critical environmental variables produce changes that are observable within the framework of the criteria of the five standards?	NA	NA					

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Consequences Which Are Specific to an
Individual Environmental Variable

Waterfowl
Bailey County, Texas
Land Disturbance

1. To what extent will the effect alter the carrying capacity of the environment for the resource?

1	2	3	4	5
no change in carrying capacity		some reduction in carrying capacity		major reduction in carrying capacity

Construction will probably result in loss of some of the smaller playa lakes by using land for project elements and by introducing pollutants into playas near construction. These should affect only smaller lakes, however, causing some reducting in wintering habitat.

2. What is the effect of the disturbance on the viability of the resource?

1	2	3	4	5
no change in viability		some decrease in viability		major decrease in viability

As the larger playas should not be strongly affected, little change in wintering waterfowl populations is expected.

3. What is the effect of the disturbance on the quality of the resource?

1	2	3	4	5
no loss in quality		some loss in quality		major loss in quality

If quality refers to health of the waterfowl population, no measureable effect is expected.

4. To what extent will the effect be masked by normal variation expressed by the resource?

1	2	3	4	5
completely masked		some masking		no masking

Variation in breeding success in the northern prairie of the U.S. and Canada is likely to mask any changes caused by some loss of wintering habitat, but no studies have been done to substantiate this.

5. To what extent will the effect on the resource be masked by normal resource variability when the influence of potential future projects other than M-X are imposed.

1	2	3	4	5
completely masked		some masking		no masking

N/A - no other significant competing projects.

6. How rapidly will the resource recover from the disturbance effect if the effect is temporary?

1	2	3	4	5
rapid recovery		slow recovery		no recovery

Those playa lakes abandonced due to construction noise should be re-occupies the next fall and winter.

7. How rapidly will the resource recover from the disturbance effect if the effect is permanent?

1	2	3	4	5
rapid recovery		slow recovery		no recovery

Playa lakes lost due to construction or pollution would force redistribution of migratory or wintering flocks to reduce crowding. This may cause a proportion of the populations to winter elsewhere, perhaps outside the DDA.

8. To what extent will the resource recover from the disturbance effect in a reasonable time period?

1	2	3	4	5
full recovery		moderate recovery		no recovery

Recovery should be complete or nearly so, as the disturbance effect is not expected to be large.

9. To what extent will the resource recover from the effect when this effect is combined with other disturbances expected from M-X (cumulative effects)?

1	2	3	4	5
full recovery		moderate recovery		no recovery

N/A

10. How geographically widespread is the effect of the disturbance on the resource?

1	2	3	4	5
localized effect				widespread effect

Redistribution to new wintering lakes could be over much of the western portion of the Texas Panhandle.

11. To what extent will the effect change the aesthetic value of the resource?

1	2	3	4	5
no change in aesthetic value		moderate decrease in aesthetic value		major decrease in aesthetic value

Waterfowl enthusiasts and other non-consumptive recreationists may see local declines in wintering waterfowl.

12. What is the scientific or intrinsic value of the resource?

1	2	3	4	5
low scientific or intrinsic value		moderate scientific or intrinsic value		high scientific or intrinsic value

Waterfowl are a major game resource and have wide appeal to people interested in many aspects of the environment. Additionally, as the DDA is part of the wintering ground for over 1,000,000 waterfowl and migratory stopover for another 1,000,000, the area is important to the maintenance of the Central North American waterfowl populations.

Issue 1
Competition for Resources

1. How does a change in the effect affect the viability of the resource?

1	2	3	4	5

2. To what extent will the resource continue to be usable with the same level of quality and capacity for renewal that it previously had

1	2	3	4	5
no reduction in usefulness to humans		partial reduction in usefulness to humans		major reduction in usefulness to humans

Some reduction may occur if there is localized long-term displacement.

3. What is the extent to which the resource will become limited to the point of threatening the carrying capacity of the area or developmental trends which have already been in motion for some historic period of time.

1 2 3 4 5

N/A as phrased

1 2 3 4 5

Issue 2
Constraint on Future
Development Opportunities

1. Is the change in the effect observable relative to the potential variations in the baseline or trust or other competitors for these development opportunities.

1	2	3	4	5

N/A

2. To what extent does the change in the effect produce a developmental constraint that is observable?

1	2	3	4	5

N/A

3. To what extent does the change in the effect variable degrade the environmental resource which is or would be needed by other competitors?

1	2	3	4	5
no constraint on other future uses		moderate constraint on other future uses		major constraint on other future uses

N/A

4. To what extent does the change in the environmental variable when combined with competing opportunities cause a considerable stress on some portion of the environment which would not occur if the competition were not there or if constraints were imposed on the developmental directions for the various interested competitors.

1	2	3	4	5

N/A

5. To what extent is the change in the effect variable a significant modifier of other developmental actions which are planned to take place. For example, will it compete for the same space, will it cause that space to be unusable, will it require stress on limited resources, changes in transportation of goods, etc.?

1	2	3	4	5

N/A

1	2	3	4	5

Issue 3
Stress on Growing Communities

1. Is the change in the effect variable large or the same value as established standards for this particular effect?

1	2	3	4	5

N/A

2. Is there a reasonable opportunity for recovery from changes in this effect in a reasonable period of time?

1	2	3	4	5

N/A

3. Will the quality of the area necessarily have to be changed in order to accommodate the changes in these effects?

1	2	3	4	5

N/A

4. Will the change in these effects levels produce a permanent change in some sector of the environmental and if so will that change be in total contrast with other induced changes already in process for the future development of the area or will these permanent changes be in concert with other expected changes?

1	2	3	4	5

N/A

5. Will the change in the effect level be significant within the context of the uncertainties of the growth pattern of the impacted regions? That is, if one assumes a 10 percent potential fluctuation in either the compositional structure of the demographics or in the absolute value of the population growth will the changes due to M-X be significantly larger or approximately the same amount of much smaller than this 10 percent absolute change?

1	2	3	4	5

N/A

6. Will growth trends in the area in terms of sectoral composition, population density, urban-rural transitions, and other uses of the land be modified significantly by M-X or will M-X's changes fit within the predicted trends for these areas?

1	2	3	4	5

N/A

7. Will planning for these areas require significant funding specifically for the properties and requirements of M-X or can they be included in umbrella types of funding which would include the future plans of the area and those requirements of M-X which add stress to the growing communities?

1	2	3	4	5

N/A

8. Will M-X require significant additional short-range planning or planning significantly accelerated relative to the planning required for the future development of the area?

1	2	3	4	5

N/A

9. To what extent will funding be required to mitigate the effect on the resource?

1	2	3	4	5
no funding required to mitigate		moderate funding required to mitigate		major funding required to mitigate

Mitigation would require on-site alteration of placement of project elements to avoid playa lakes as much as possible, and use of spilled pollutant containment technquies to minimize pollutants being carried by runnoff into the playalakes.

10. To what extent will the effect on the resource have significant economic or social consequences on communities within the study area?

1	2	3	4	5
no significant economic or social consequences				major significant economic or social consequences

There might be a reduction in the number of hunters in localized areas where the waterfowl would be forced to leave.

Issue 4
Preservation of Biophysical and
Cultural Resources

1. What is the legal status of the resources changed from?

1	2	3	4	5
no legal status	state protected (game & nongame)	state protected rare or endangered	proposed federally protected	federally protected species (threatened & endangered)

Waterfowl are covered by state game laws and the Migratory Bird Act, which covers waterfowl breeding in Canada and watering in the U.S., among others.

2. Will a change in the effect potentially indirectly affect those resources which are legally protected?

1	2	3	4	5
minimal likelihood of affecting a legally protected resource		moderate likelihood of affecting a legally protected resource		high likelihood of affecting a legally protected resource

Due to lack of data on the areal and food requirements in wintering wterfowl, effect of loss of habitat is assumed proportional to population impact, which should therefore not be large.

3. Will a change in the effect require either behavioral modifications or changes in life patterns in order to preserve the specific cultural resources?

1	2	3	4	5

N/A

4. Will a change in the effect lead to a permanent degradation of some portion of the ecosystem which the cultural resources depends on?

1	2	3	4	5

N/A

5. Will a change in the environment effect lead to a degradation of some portion of the ecosystem which contains resources needed for the preservation of a cultural or biological resource?

1	2	3	4	5

N/A

6. Will a change in the effect level cause a degradation in the quality or aesthetics of the particular resource that is to be preserved, and will this be a major or a minor change in the aesthetic or quality feature?

1	2	3	4	5
no degradation of quality or aesthetics		moderate degradation of quality or aesthetics		major degradation of quality or aesthetics

Degree of change is linked to how critical the loss of some wintering habitat is.

General Consequences

1. Are the consequences such that the portion of the ecosystem or society will not recover at all?

1	2	3	4	5
no likelihood of irreparable damage to ecosystem		moderate likelihood		certain irreparable damage to ecosystem

2. Are the consequences such that the impact maybe large, but the recovery processes will overcome the damage in a reasonable period of time?

1	2	3	4	5
full recovery		partial recovery		no recovery

N/A - Impact not large.

3. Are the deleterious effects measurable?

1	2	3	4	5
not measureable		measureable with difficulty		readily measurable

Populations of wintering species would have to be monitored before construction and throughout project life, and changes would have to be compared with breeding censuses to see whether there was a consistent increase in winter mortality, not attributable to random even to such as unusually severe winters, etc.

4. Will a change in the effect change the functional relationships existing within the ecosystem and will this cause a change in either the carrying capacity or other characteristics of viability associated with the system?

1	2	3	4	5
no change in in functional relationships		moderate change in relationships		major change in relationships

If the change were large, yes, but the chang in effect is not expected to be, so any change in functional relationships would probably be small.

5. Do these deleterious effects or consequences result in degradation of other measurable environmental variables?

1 2 3 4 5

N/A

6. Although the environmental effect itself may not be significant within the framework of the first five criteria, will it when measured in conjunction with certain other critical environmental variables produce changes that are observable within the framework of the criteria of the five standards?

1 2 3 4 5

N/A

Consequences Which Are Specific to an
Individual Environmental Variable

Lesser Prairie Chicken
Roosevelt County, New Mexico

Effect - Habitat Loss, Short and Long-term

1. To what extent will the effect alter the carrying capacity of the environment for the resource?

1	2	3	4	5
no change in carrying capacity		some reduction in carrying capacity		major reduction in carrying capacity

Although data on location of leks and breeding areas are not available, loss of shortgrass prairie has been held responsible for the bird's decline. Therefore it is conservative to assume population loss at least proportional to the area lost, 831 acreas (332 ha), on a long-term basis. This area will be made larger during construction due to avoidance of noise and other disturbances. An assumption of 1 mile's avoidance distance for noise was used as for sage grouse, in the absence of species-specific in format on, but gave too unrealistic an estimate for disturbed area. This remains problematical.

2. What is the effect of the disturbance on the viability of the resource?

1	2	3	4	5
no change in viability		some decrease in viability		major decrease in viability

Permanent loss of habitat would, as stated above, be proportional to carrying capacity, which should cause some decrease in viability due to potential removal of brood areas, causing reduced reproductive capacity of the population. The degree of this depends on brood area lost, which cannot be calculated due to lack of field data.

3. What is the effect of the disturbance on the quality of the resource?

1	2	3	4	5
no loss in quality		some loss in quality		major loss in quality

As lesser prairie chicken are game birds and are the object of conservation activity, reduction in population presents a potential threat to the viability of the resource and would reduce potential hunting yield.

4. To what extent will the effect be masked by normal variation expressed by the resource?

1	2	3	4	5
completely masked		some masking		no masking

As in any population whose variability in size is dependent on severity of winters, droughts, etc., there will be some masking of the M-X caused decrease.

5. To what extent will the effect on the resource be masked by normal resource variability when the influence of potential future projects other than M-X are imposed.

1	2	3	4	5
completely masked		some masking		no masking

N/A

6. How rapidly will the resource recover from the disturbance effect if the effect is temporary?

1	2	3	4	5
rapid recovery		slow recovery		no recovery

As many grouse populations seem to recover from natural disturbances within 2-5 years, recovery should be moderate to slow.

7. How rapidly will the resource recover from the disturbance effect if the effect is permanent?

1	2	3	4	5
rapid recovery		slow recovery		no recovery

Successful maintenance of population sizes is dependent on leks and brooding areas. Permanent loss of these would most likely keep the population down at a lower level proportional to this loss.

8. To what extent will the resource recover from the disturbance effect in a reasonable time period?

1	2	3	4	5
full recovery		moderate recovery		no recovery

After temporary construction disturbances ae removed, some recovery is expected, again dependent on the degree of habitat permanently lost.

9. To what extent will the resource recover from the effect when this effect is combined with other disturbances expected from M-X (cumulative effects)?

1	2	3	4	5
full recovery		moderate recovery		no recovery

N/A

10. How geographically widespread is the effect of the disturbance on the resource?

1	2	3	4	5
localized effect				widespread effect

11. To what extent will the effect change the aesthetic value of the resource?

1	2	3	4	5
no change in aesthetic value		moderate decrease in aesthetic value		major decrease in aesthetic value

It may increase it as the birds become rarer.

12. What is the scientific or intrinsic value of the resource?

1	2	3	4	5
low scientific or intrinsic value		moderate scientific or intrinsic value		high scientific or intrinsic value

It is a bird becoming rarer, and a hunted resource.

Issue 1
Competition for Resources

1. How does a change in the effect affect the viability of the resource?

1	2	3	4	5

?

2. To what extent will the resource continue to be usable with the same level of quality and capacity for renewal that it previously had

1	2	3 →	4	5
no reduction in usefulness to humans		partial reduction in usefulness to humans		major reduction in usefulness to humans

Depending, again, on leks and brood areas lost.

3. What is the extent to which the resource will become limited to the point of threatening the carrying capacity of the area or developmental trends which have already been in motion for some historic period of time.

1	2	3	4	5

N/A

1	2	3	4	5

Issue 2
Constraint on Future
Development Opportunities

1. Is the change in the effect observable relative to the potential variations in the baseline or trust or other competitors for these development opportunities.

1	2	3	4	5

N/A

2. To what extent does the change in the effect produce a developmental constraint that is observable?

1	2	3	4	5

N/A

3. To what extent does the change in the effect variable degrade the environmental resource which is or would be needed by other competitors?

1	2	3	4	5
no constraint on other future uses		moderate constraint on other future uses		major constraint on other future uses

N/A

4. To what extent does the change in the environmental variable when combined with competing opportunities cause a considerable stress on some portion of the environment which would not occur if the competition were not there or if constraints were imposed on the developmental directions for the various interested competitors.

1	2	3	4	5

N/A

5. To what extent is the change in the effect variable a significant modifier of other developmental actions which are planned to take place. For example, will it compete for the same space, will it cause that space to be unusable, will it require stress on limited resources, changes in transportation of goods, etc.?

1 2 3 4 5

N/A

1 2 3 4 5

Issue 3
Stress on Growing Communities

1. Is the change in the effect variable large or the same value as established standards for this particular effect?

1	2	3	4	5

N/A

2. Is there a reasonable opportunity for recovery from changes in this effect in a reasonable period of time?

1	2	3	4	5

N/A

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3. Will the quality of the area necessarily have to be changed in order to accommodate the changes in these effects?

1	2	3	4	5

N/A

4. Will the change in these effects levels produce a permanent change in some sector of the environmental and if so will that change be in total contrast with other induced changes already in process for the future development of the area or will these permanent changes be in concert with other expected changes?

1	2	3	4	5

N/A

5. Will the change in the effect level be significant within the context of the uncertainties of the growth pattern of the impacted regions? That is, if one assumes a 10 percent potential fluctuation in either the compositional structure of the demographics or in the absolute value of the population growth will the changes due to M-X be significantly larger or approximately the same amount of much smaller than this 10 percent absolute change?

1	2	3	4	5

N/A

6. Will growth trends in the area in terms of sectoral composition, population density, urban-rural transitions, and other uses of the land be modified significantly by M-X or will M-X's changes fit within the predicted trends for these areas?

1	2	3	4	5

N/A

7. Will planning for these areas require significant funding specifically for the properties and requirements of M-X or can they be included in umbrella types of funding which would include the future plans of the area and those requirements of M-X which add stress to the growing communities?

1	2	3	4	5

N/A

8. Will M-X require significant additional short-range planning or planning significantly accelerated relative to the planning required for the future development of the area?

1	2	3	4	5

N/A

9. To what extent will funding be required to mitigate the effect on the resource?

1	2	3	4	5
no funding required to mitigate		moderate funding required to mitigate		major funding required to mitigate

Some money could be spent restoring disturbed shortgrass prairie tothe point where it is usable for brood areas.

10. To what extent will the effect on the resource have significant economic or social consequences on communities within the study area?

1	2	3	4	5
no significant economic or social consequences				major significant economic or social consequences

Issue 4
Preservation of Biophysical and Cultural Resources

1. What is the legal status of the resources changed from?

1	2	3	4	5
no legal status	state protected (game & nongame)	state protected rare or endangered	proposed federally protected	federally protected species (threatened & endangered)

The lesser prairie chicken is a state-regulated game bird.

2. Will a change in the effect potentially indirectly affect those resources which are legally protected?

1	2	3	4	5
minimal likelihood of affecting a legally protected resource		moderate likelihood of affecting a legally protected resource		high likelihood of affecting a legally protected resource

3. Will a change in the effect require either behavioral modifications or changes in life patterns in order to preserve the specific cultural resources?

1	2	3	4	5

N/A

4. Will a change in the effect lead to a permanent degradation of some portion of the ecosystem which the cultural resources depends on?

1	2	3	4	5

N/A

5. Will a change in the environment effect lead to a degradation of some portion of the ecosystem which contains resources needed for the preservation of a cultural or biological resource?

1	2	3	4	5

?

6. Will a change in the effect level cause a degradation in the quality or aesthetics of the particular resource that is to be preserved, and will this be a major or a minor change in the aesthetic or quality feature?

1	2	3	4	5
no degradation of quality or aesthetics		moderate degradation of quality or aesthetics		major degradation of quality or aesthetics

Loss of game bird population is a sensitive issue.

General Consequences

1. Are the consequences such that the portion of the ecosystem or society will not recover at all?

1	2	3	4	5
no likelihood of irreparable damage to ecosystem		moderate likelihood		certain irreparable damage to ecosystem

This is linked to permanent habitat lost.

2. Are the consequences such that the impact maybe large, but the recovery processes will overcome the damage in a reasonable period of time?

1	2	3	4	5
full recovery		partial recovery		no recovery

3. Are the deleterious effects measurable?

1	2	3	4	5
not measureable		measureable with difficulty		readily measurable

Monitoring of populations over several years should allow detection of steady decline against a background of natural fluctuations around a mean.

4. Will a change in the effect change the functional relationships existing within the ecosystem and will this cause a change in either the carrying capacity or other characteristics of viability associated with the system?

1	2	3	4	5
no change in in functional relationships		moderate change in relationships		major change in relationships

Can't sensibly answer this, as position of lesser prairie chicken in overall system is not known.

5. Do these deleterious effects or consequences result in degradation of other measurable environmental variables?

1	2	3	4	5

N/A

6. Although the environmental effect itself may not be significant within the framework of the first five criteria, will it when measured in conjunction with certain other critical environmental variables produce changes that are observable within the framework of the criteria of the five standards?

1	2	3	4	5

No.

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